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KEPPEL STREET,
LONDON, W.C.1

JOURNAL

OF THE

ROYAL

STATISTICAL SOCIETY.

(𝔉𝔬𝔲𝔫𝔡𝔢𝔡 1834.)

INCORPORATED BY ROYAL CHARTER 1887,

Vol. LXII.—Year 1899.

68950

NOTICE.

ROYAL STATISTICAL SOCIETY.

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Vol. LXII.—Year 1899.

March, 1899.

December, 1899.

The EXCESS of IMPORTS.

By SIR ROBERT GIFFEN, K.C.B., LL.D., F.R.S.

[Read before the Royal Statistical Society, 17th January, 1899.
The Right Hon. LEONARD H. COURTNEY, M.A., M.P., President, in the Chair.]

CONTENTS :

A GOOD many years ago I discussed at some length before the Statistical Society the question of the excess of imports over exports—the balance of trade. The discussion was contained in a paper on the use of import and export statistics which I read at the meeting of the Society on the 21st March, 1882. This was primarily a paper on the method of statistics, and the excess of imports question was dealt with by way of illustration. But the question is of course of independent interest, and the mode of treating it in the paper referred to has been widely discussed and applied. It will be interesting now to see what the history has been since that paper was read, how far and to what extent has the excess of imports over exports increased, how far would the conclusions then arrived at be applicable at the present time? There is also a special point of some interest which was not adverted to in the former paper, but on which some observations and tables are now offered, viz., what is the relative position of different countries with which we trade as regards the excess of imports into this country? The whole inquiry also raises at least one point of novelty which is proposed to discuss later, viz.,

how far and with what effect an increasing excess of imports over exports may not tend to prevent the expansion of the export trade itself ?

There is one preliminary remark to be made. This paper is not written in a controversial spirit; especially it is not written with any notion of confuting the believers in fair trade or any other persons who attach importance to the balance of trade, because they think an adverse balance, such as they see in the figures, proves the decay of British trade abroad, and that the country is in a bad way accordingly. How these gentlemen arrive at their conclusions I must confess I do not know, but in any event it is no part of my present purpose to discuss their reasoning. Our object as a Society is to get out the facts as to our imports and exports, as we do with other statistics, in the best way we can. How the excess of imports arises, and what is the real nature of the position of this excess in the larger question of the balance of indebtedness between this country and others, are the facts we desire to know.

I.—*The Increase since* 1880.

In the Appendix (Table A) a statement is continued from the former paper showing the total imports and exports of the United Kingdom, including bullion and specie in each year since 1854. There is a part of the trade, the trans-shipment trade, which is usually omitted in the record of imports and exports, but as the outward movement here exactly balances the inward movement, the omission is immaterial in any question of the balance of trade generally. For various purposes as we shall see, however, the fact of a trans-shipment trade existing to the extent of about 10 million £ either way must not be lost sight of. In this table then the excess of imports over exports in each year, and the proportion of the excess to the total imports and exports omitting the trans-shipment trade, are brought out, and as the table goes back to 1854, we get a very comprehensive view indeed of what this feature in our foreign trade has been. The excess, as was pointed out in my former paper, is no new feature, and it is also a feature quite common to the foreign trade of most countries throughout the world, especially to European countries.

I have continued a summary of the table of 1882 in three years periods, and the summary for the whole period since 1854 is as follows :—

Excess of Imports, and Proportion to Total Imports and Exports, including Bullion and Specie, 1854-97.

[In millions of £'s.]

	Total Imports and Exports.*	Excess of Imports.	
		Amount.*	Per Cent. of Imports and Exports.
	£	£	£
1854–56	330	37	11·2
ʼ57–59	386	31	8·0
ʼ60–62	432	54	12·5
ʼ63–65	523	60	11·5
ʼ66–68	566	66	11·7
ʼ69–71	617	61	9·9
ʼ72–74	732	61	8·3
ʼ75–77	713	121	17·0
ʼ78–80	690	120	17·4
ʼ81–83	755	109	14·4
ʼ84–86	691	91	13·2
ʼ87–89	735	95	12·9
ʼ90–92	802	122	15·2
ʼ93–95	761	141	18·5
ʼ96–98	847	160	18·9
1896....................	822	140	17·0
ʼ97....................	844	156	18·5
ʼ98....................	875	183	20·9

* Average of three years.

From this summary table it appears clearly that while since 1880 the total imports and exports have increased from about 700 million £ annually to over 800 million £ annually, the increase in the excess of imports, comparing the last three years period which was dealt with in 1882, with the last three years period we now have, is from about 120 to 160 million £. The percentage of the excess of imports over exports has also risen a little, viz., from 17 to 19 per cent. In the last year of all, 1898, the figures are larger and the proportion of the excess of imports to the total imports and exports has risen to over 20 per cent. It remains to be seen, however, whether on a three years' average the permanent rise will be found to be sensibly greater than what has been stated. It will be observed from the table also that, as was the case before 1880, the excess of imports over exports is not uniform from period to period, but in several years since 1880 the excess was much less than what it had been in the three years then preceding. In 1884-89, a period of six years, it was a little more than 90 million £ annually on the average, and the proportion was only 13 per cent. In two years it was 80 and 82 million £ only, and the excess 12 per cent. The excess in fact diminishes as a rule in years of good trade when this country is giving credit largely and

lending largely to foreign countries and colonies, and it increases
again in times of depression when we are not giving so much
credit, and are, in fact, to some extent calling in our money and
getting payment of our debts. The permanent condition of our
trade however is that we receive a large excess of imports, and
from period to period, ever since 1854 at any rate, this excess
steadily increases.

How is the excess to be accounted for? For answer, in
principle, I may refer you to the former paper. It was shown
there that in the whole trade of the world, putting imports and
exports together, there is on balance an excess of imports. The
figure was then about 160 million £, and I understand from an
official friend who has made the calculation, though I have not
thought it necessary for the purpose of this paper to do so myself,
that the figure would be almost exactly the same now. The
obvious reason for such an excess is that if goods arriving in a
country are valued at the place of arrival and exports are valued
at the place of shipment, which is commonly, though not universally
the case, it follows that as goods acquire value in the course of
transit from one country to another, the expense of the transit
being added to the value, then the same goods reckoned as imports
must appear in the returns of greater value than when they were
reckoned as exports. The nature of the returns is therefore such
that in a given country the volume of the imports is not unlikely
to appear greater than the volume of the exports. Whatever
may be the case with some other countries, there is no doubt that
this explanation applies to the imports and exports of a country
like the United Kingdom. Here the imports are undoubtedly
valued at the place of arrival and the exports at the place of
shipment, and, putting aside all other considerations, the presump-
tion is when this method of valuation is followed that the exports
should not balance the imports.

Apart from this formal explanation, a real cause of difference
which was the subject of discussion in the paper referred to, is
the position of this country as a shipping country earning large
freights in the course of its business as shipowner. A country
which has a large mercantile marine engaged in the business of
carrying goods and passengers, not merely to and from its own
shores, but between foreign countries themselves, earns a great
deal of money which must be paid to it, unless the money is
reinvested again, in the shape of imports. The freights earned
constitute, in fact, an invisible export, to use the phrase of the
previous paper, and in any question of the balance of trade ought
to appear to the credit of the country earning the freights as
much as the so-called exports themselves. In the former paper it

was shown that on any fair calculation the difference thus made to the United Kingdom amounted to no less a sum than about 60 million £ sterling annually.

Another fact to be taken note of in connection with this question of the balance of trade, is the amount earned by a country like England in its commission business generally. As the centre of the monetary transactions of the world, England receives commissions on produce brought to this country to be sold on account of third parties. It receives money again as an insurer of ships and cargoes. It also receives commissions on the bills which are drawn against goods from all parts of the world, and which are cleared finally in Lombard Street. These commissions and payments must be very considerable and fall to be added to the freight earnings themselves in a question as to the balance of trade. They were estimated in the former paper—a very rough estimate however—at 16 million £.

Another most important item in the balance of indebtedness is the profits on English capital employed in foreign business. With this we must include the interest on permanent investments made in foreign countries which has to be received in the United Kingdom. Several European countries as well as the United Kingdom are in the position of receiving interest of this nature. France, Holland, Belgium, and Germany are undoubtedly all in this category of interest-receiving nations, Germany probably less so than France, although it has of late years been rapidly increasing its foreign business generally and its foreign investments. With this amount we ought to include, as I am reminded, the sums due annually by a country like India to England for salaries, pensions, and annuities due to it by the Government or by a private company to persons whom they employ or have employed, so far as the salaries, annuities, and pensions are remitted to England. The amount due in this way by the Government of India alone is about 6 million £, and there are other items of the same kind in our intercourse with India and other countries which cannot be strictly spoken of as interest or profit on capital though they have been lumped together. The amount of this profit, interest, and pensions, &c., annually receivable by England was estimated in the paper of 1882 which has been referred to at something over 70 million £, representing a capital, if all capitalised, of not less than 1,500 million £ invested abroad. The sum was and is a very large one, although no exact statement can be made.

All these are important items to be taken note of, not merely as accounting for the excess of imports over exports in a particular case, but as necessarily entering into the international account

between a ship-owning and investing country like England, and the rest of the world generally. There are no doubt other items of importance. A chapter, for instance, might be written on the subject of remittance to and fro between different countries, to pay for travellers and residents of one nation in the territory of another nation. This would rectify the accounts of some countries in one direction only, and in other countries in both directions, so that in the latter case the rectifications might balance each other. The United States is a good illustration of a country which probably has to remit largely abroad to pay for its citizens resident or travelling in foreign countries. In the case of the United Kingdom and most European nations there would be rectifications both ways, and how the balance would lie it would be most difficult to calculate. Among other items, again, I would mention specially, the new loans to foreign countries, and the withdrawals of capital from such countries, which change the balance of indebtedness for the moment from one side to the other. The new lending especially is most important, but permanently the items above stated appear to be the most necessary for our consideration. They explain fully why the excess of imports exists and the cause of it, and suggest, as was pointed out in 1882, that but for continual new lending on balance on the part of this country, and without any withdrawals of capital from abroad, the excess of imports would probably be larger than it is.

It should be understood further that the account in detail is by no means complete. For instance, an item like the import of diamonds from the Cape and from other countries, as well as the export of diamonds, is omitted altogether. It is known from special returns which the Cape Government furnishes to our customs authorities, and which are referred to in foot-notes in our trade returns themselves, that the Cape sends to us annually over 4 million £'s worth of diamonds; but this one fact is insufficient to rectify the returns as regards the diamond trade. It is also contended in some quarters that the value of coal put on board steamers for consumption ought to be treated as an export, as it affects the balance of trade in the same way. The same with the value of goods put on board foreign ships of war in this country, and so on. Above all it is asserted that the building of ships for foreigners, and the sale of old ships to foreigners, are, in fact, exports affecting the balance of trade in the same way as other exports, and that they ought so to appear in the returns. In a recent year it is said the ships building for, and the sale of ships to, foreigners might amount to a sum of nearly 7 million £. These, however, are all minor matters, in my judgment, however important some of them may seem. No

such record as that of imports and exports can be absolutely complete, and it is better practically to take the returns as they are upon their existing basis and make the best of them rather than attempt a formal completeness which can never be attained. Moreover, it is extremely important in these inquiries to avoid duplication, and clearly such items as the value of coal put on board steamers for consumption upon the voyage are more properly taken account of in connection with the cost of earning freights, than by being treated as on all fours with ordinary exports. The same to some extent with the value of ships built for foreigners. A good many of the ships which go under foreign flags remain English owned, and in an economic sense a good many of these so-called exports to foreigners are not really exports, because the ships remain English and not foreign although under a foreign flag. It is right, nevertheless, that those who go into the subject in great detail should take note of all these points.

The explanations thus given as to the excess of imports over exports in 1882 are now fully applicable. We may go over the different items. Beginning with our commission business, and our investments in foreign countries, we find there is no doubt that these have both increased. With regard to the latter it is certain that there are always new issues of foreign securities.

In the paper of 1882 a list was given of new issues in London on foreign account for several years, and this was afterwards continued in my book on " The Growth of Capital " (see p. 41). The total for the ten years ending 1885 was 362 million £, exclusive of issues for miscellaneous companies and mining companies, which would bring up the total in some years to from 15 to 20 million £ a year more. The issues in the last five years of the period were also greater than in the first five years. In a recent speech at Croydon, the President of the Board of Trade stated that, according to figures which he had caused to be extracted from the "Economist," the issues in the five years ending 1896 had amounted to about 283 million £, which is at the rate of 56 million £ annually, or at a rather greater rate than ten years before. In the time at my disposal it has not been possible for me to have a complete and exhaustive list made for the whole period; but figures I have obtained quite confirm Mr. Ritchie's statement. A complete statistical account would not be very easy, owing to the difficulties occasioned by issues in more countries than one, and to the distinction that would have to be made between the nominal amounts of the issues and the sums actually invested abroad—a distinction of obvious importance in connection with the issues of public companies. Still we do not need such an

account to perceive how the facts lie—that there is a steady issue of new securities on account of foreign countries and British colonies, greater in some years than others, but never altogether ceasing. The figures suggest that in the sixteen years since 1882 the new public investments abroad have amounted to over 800 million £, and although part of the sum may have been nominal only, the real investment must have been enormous.

I may refer especially also in connection with this subject to the large and profitable results which have been obtained in the last ten years or thereabouts in South Africa and in Western Australia. There are bad as well as good investments, and our special business in this connection is rather with the return upon the investment than with the investment itself. The annual product then of the gold mines in these two districts alone, no part of which returned any interest to speak of in 1882, now amounts to upwards of 20 million £, and may possibly in the current year or the next greatly exceed that figure. The share of this 20 million £, which comes to this country as profit, must be very considerable. No doubt there are losses to be considered on the other side, as more than one country has defaulted and reduced the interest paid upon its indebtedness, while in Australia, although the Governments have not defaulted, there has been a great reduction on the interest upon deposits made in the banks of those countries. But looking at the matter generally, there can be no doubt that the return on foreign investments on balance has increased, and that in the present year we are entitled to receive more interest than in 1882; possibly 90 million £ now would not be far off the mark.

An interesting letter from an undoubted authority, signed " Blue Book," appeared in the " Times " of 29th November last, from which I should like to make the following extracts :—

" The income of foreign origin remitted to this country, so far " as it can be indentified, is assessed to income tax, partly on " Schedule C (interest payable out of public revenue of foreign " countries and the colonies), and partly under Schedule D (interest " on other foreign securities, profits from railways abroad, and " other foreign profits).

" The income tax in this way in the year 1896-97, the latest for " which figures have been published, was 56,318,000*l.*, and the " excess of imports over exports in the year 1896 was 146 million £, " leaving a balance of 89,682,000*l.* to be accounted for in other ways.

" Going back twenty years to the calendar year 1877, and the " financial year 1877-78, I find that the amount of foreign income " tax was 28,774,000*l.*, and the excess of imports 141 million £, " leaving an uncovered balance of 112,226,000*l.*

" It is true that the income tax figures do not carry us beyond
" the year 1896-97, but before drawing any conclusions as to the
" cause of the growth in the excess of imports in 1897-98, it may
" be as well to await the income tax returns of those years.

" It must also be borne in mind that the figures give only the
" foreign income which can be identified as such.   There must be
" a very large amount of income remitted from abroad which
" would appear in the income tax returns as the profits of
" businesses carried on in the United Kingdom, such as insurance
" companies, investment trusts, and land mortgage companies.

" In the ' Banker's Magazine ' for the current month there is
" an article on the interest problem in life insurance, from which
" it appears that the published returns of 1898 show an invest-
" men of nearly 13 million £ on mortgages outside the United
" Kingdom, and that this item has increased by 7 million £
" since 1890."[1]

These statements which are made by " Blue Book " from
intimate acquaintance with the figures of the Inland Revenue
Department, must carry conviction, along with the information
from all other sources, as to the extent of the income derived in
this country from its foreign investments.   The sum that is
known is so large that if we add to it even a moderate estimate of
what is not quite known, and include the income from pensions,
&c., which apparently would not figure in the income tax returns
as profits on capital, it can easily be seen that the figure of
90 million £ which has been stated is not far off the mark.

Our commission business must also have increased very con-
siderably since 1882.   London is even more than it was the centre
of the banking transactions of the world.   The increased move-
ment of foreign trade in our own country, as we have seen, is
from about 700 million £ to over 800 million £ annually in the
period between 1882 and the present time.   Assuming that our
commissions have increased no more than in proportion to this
increase of trade, and that the figure of 16 million £ in 1882 was
a reasonable estimate, we should now be quite justified in assuming
a figure for the present time of 18 million £.   On this head little
more than a guess can be given, but the figure must be large.

The subject of freight earnings, however, appears to me of
even more interest, partly on account of the magnitude of the
sums involved, and partly on account of the great development of
our shipping trade which has taken place since 1882.   In the
paper of 1832 the amount of our shipping was stated as just

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[1] In these extracts the figures of the excess of imports are not the same as in
the above tables, the difference arising from bullion being included in the tables
and not so here.

under 4 million tons of sailing ships, and 2½ million tons of steam ships, total 6½ million tons. Since that time the sailing ships have diminished to 2½ million tons, but the steam fleet has increased to 6½ million tons. The change represents an enormous difference in efficiency. Applying the same rule that was applied in 1882 so as to reduce the efficiency of the mercantile fleet to a common denominator, that is multiplying the steam ton by four to show its equivalence with the sailing ton, we may say that the capacity of the mercantile fleet of the United Kingdom since 1882 has increased from about 14 million sailing tons to about 29 million sailing tons; that is, the tonnage is practically double what it was.[2] Using the formula of 1882, viz.: 5*l.* per ton as the annual earnings of sailing ships, and 15*l.* per ton as the annual earnings of steamers, we should reach a sum of no less than 110 million £ annually as the earnings of our mercantile fleet, which would of course more than account, with the other items mentioned, for the excess of imports.

We cannot, however, suppose the earnings to be quite so large per ton. We know from other sources that freights have been reduced since 1882. In the special statistical tables relating to British trade and production, 1854-95, issued by the Board of Trade in 1896 (C–8211), there is a statement showing what the course of freights has been from 1872, and I have had these figures continued to the present time. The following short summary will give some idea of the changes :—

Freights in 1880-81 *and in* 1898 *compared.*

	1880–81.		1898.	
	s. d.	*s. d.*	*s. d.*	*s. d.*
Grain—				
New York to United Kingdom, per quarter....	6 –	—	3 9	—
Philadelphia to United Kingdom, per quarter	6 –	—	3 9	—
San Francisco to United Kingdom, per ton of wheat	62 6 to 65 –		25 – to 27 6	
Odessa to United Kingdom, per quarter	20 – „ 22 6		11 –	—
Guano—Chinchas to United Kingdom	40 – „ 42 6		26 3 to 27 6	
Rice—Rangoon, &c., to the United Kingdom, sailing ship	50 – „ 52 6		26 3	—
Coal—				
Wales to Aden, per ton	19 6	—	16 –	—
„ Bombay	22 –	—	15 3	—
„ Gibraltar	9 6	—	8 6	—
„ Madeira, sailing vessel	12 –	—	8 3	—

[2] Assuming the steam ton to be no more than the equivalent of three sailing tons, it would still be true that the efficiency of the fleet has been doubled since the date in the paper of 1882. This is confirmed by Table E in the Appendix, showing an increase in the quantity of coal put on board steamers for consumption in the foreign trade from 5 to over 11 million tons since 1880-82.

It would have been instructive to pick out one or two of the items to show the complete history, as freights have been higher during the last two years than they appear to have been for some years before; but the changes have evidently been very considerable, and they apply to a very important part of the shipping trade, principally to the steamers conveying goods on long voyages. It does not follow that there is an equal and universal reduction in the earnings of our mercantile fleet as there is in the freights quoted. Many of the vessels depend largely on the mail and passenger traffic, while it will be observed that the diminution in the rate of freight on short voyages, even in the above table, is much less than on long voyages. The carrying capacity of ships has also increased, so that if they get less per ton for what they carry, yet as they carry more tons, their gross earnings are not proportionally reduced. Still there is a great reduction of some kind in earnings per ton, and although the mercantile fleet has been increasing, as we have seen, there can be no doubt that the larger amount of work that it has been doing has been at a less rate, so that the gross income of the fleet cannot have increased in proportion.

I have collected and put in the Appendix (see Table F) a considerable number of statements which I have been able to obtain from shipowners and others acquainted with the trade, bearing upon the question of the diminution of gross earnings per ton since 1882. I should be inclined to infer from these that the gross earnings of sailing ships can hardly be put down now at more than 4*l.* per ton annually, allowing for want of employment at times, which would give a gross income for sailing ships of about 10 million £. The gross earnings of steamers, again, instead of being put at 15*l.* per ton, as was the case in 1882, I should hardly put at more than 12*l.* per ton, one year with another, at the present time, which would give about 78 million £ ; total sailing and steamships together, 88 million £. This is much less than the 110 million £ above mentioned, but it is a large sum.[3]

Even if the sum should be subjected to considerable reduction for outlays upon the ships spent abroad, and for other reasons, we should still get a large figure. To be quite safe, I propose to put the figure at from 70 to 80 millions at the present time. Whatever may be the exact sum, it seems plain that the earnings of our mercantile fleet are so considerable, that along with the income from our investments abroad, and from commissions, there can be no question of the excess of imports being sufficiently, and more

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[3] The different meanings of the word " ton " applied to shipping business should be attended to. A "ton" of shipping is a unit of measurement, and a ton of freight may be a ton weight only. The context usually indicates the meaning.

than sufficiently, accounted for. There can be no question indeed
that even in a time like the present, this country is continuing to
add to its investments in foreign countries.

Before leaving this question I should like to mention a point
that was not referred to in my former paper, but which has been
already glanced at, viz., the question of the ownership by British
merchants and others of ships sailing under foreign flags, and
which do not form part of the registered shipping of the United
Kingdom. Some of you would not fail to notice that among the
Spanish ships captured by the American fleet in the course of the
recent war, were ships which proved in fact to belong to merchants
in Liverpool,—Spanish, or Anglo-Spanish firms. While the ships
were really, and I suppose properly, flying the Spanish flag, they
were in fact owned by merchants resident in the United Kingdom.
There is reason to believe that this ownership of ships under
foreign flags is very extensive in the United Kingdom, however it
is managed, and the economic effect is to a large extent the same
as if the ships were registered in the United Kingdom and
considered to be British ships. The difference is that the crews
are more largely of foreign nationality, and the pay of the crews
would, therefore, go to the credit of the foreign nation to which
the members belonged, and not to the credit of the United
Kingdom. Still to a large extent a great deal of the cost of
running these ships and of the profits earned ought to come into
account as part of the earnings of the shipping fleet of the
United Kingdom. Of course care would have to be taken in
going into such a subject in detail to avoid duplications. The
earnings of the ships must not be counted, and then the capital
invested treated in some other account as part of the English
capital invested abroad.

Putting all the facts together, the conclusion is established
that probably even an excess of imports, at the present time
amounting to 160 million £ annually, is no more out of proportion
to our business than was an excess of 120 million £ about 1880.
The addition is really quite inconsiderable, looking at the great
development of our foreign investments and our ship-owning that
has since occurred. But for our continuing to lend and re-invest
abroad, the excess of imports would no doubt be larger than it is.

II.—*The Increase in Foreign Countries.*

Without going so fully into the question of the excess of
imports over exports in foreign countries, we may give a glance at
the facts in one or two of the leading countries to compare with
those which we have just stated for the United Kingdom. In the
Appendix accordingly there are continued one or two tables relating

to France and the United States which appeared in the paper of
1882, and a table relating to Germany is added (see Appendices
B, C, and D).

France is obviously another instance of a country having an
excess of imports like England. Except for a few years after
1860, and then for the two years 1872-73, when France was paying
the war indemnity to Germany, there has been an excess of
imports in every year since 1860. In proportion to the total
trade, however, this excess is not nearly so great as it is in the
United Kingdom. In the last year of all, 1897, it is just under
5 per cent., although in former years it has been greater, amounting
to $12\frac{1}{2}$ per cent. and upwards of the total trade between France
and other countries. What is perhaps most interesting for our
present purpose, the history is not quite the same as it has been
in the United Kingdom. At the time of my former paper, viz.,
in 1882, the excess of imports amounted on the average to
51 million £ annually on a total trade of 450 million £, or there-
abouts, which shows a proportion of about 11 per cent., but only
in two years since that time, viz., in 1885 and again in 1891, has
that amount been exceeded, the excess in those two years being
54 million £. In all the other years the figure is less than it was
thirty years ago, and in recent years it has been declining, the
average in the last three years of all, 1895-97, being just over
15 million £.

This difference in the experience of France compared with our
own does not appear to be due to any increase in the export trade,
which remains substantially about the same total that it was
twenty years ago, but it is partly due to the steady falling off in
the imports which has taken place, these imports which were close
upon 260 million £ in 1880-82, being now about 220 million £
only. Why the imports into France should have declined so much
while our own have been increasing, seems to be a matter for an
interesting inquiry. One explanation obviously is that France
is a country of stationary population, and consequently the fall of
prices of commodities, which tends to diminish the nominal volume
of the foreign trade, is not compensated by the natural tendency
for the trade to increase along with an increase of population.

Another explanation is that the difference in the experience
of France must be partly due to the fact that France is without
that important element which gives us a large part of our
excess of imports, viz., the earnings of an immense shipping fleet.
Of course, as the imports have diminished, while the exports have
not diminished, the inference would seem to be justified that
France in recent years has been increasing its investments in
foreign countries. Otherwise the exports would probably have

been even less than they have been and the excess of imports
larger than it is.

Let us take next the case of Germany, which is also a country
that has plainly come into the class which are entitled to an
income from other countries, either by means of their invest-
ments abroad or by means of their carrying power. The excess
of imports in Germany, then, has been on the average during the
last few years about 40 million £, even larger figures having been
reached in one or two years. I am sorry that the figures cannot
be carried very far back with any confidence. Statistics of the
foreign trade of the German Empire only begin about 1880, and
various changes have from time to time occurred, such as those
in connection with the incorporation of Hamburg and other free
cities in the Empire which are apt to make comparisons with
previous periods very difficult. There seems no reason to doubt,
however, that the suggestion of the table as to the small amount
of the excess of imports before 1889 is a correct one, and that it
is only of late years that Germany has become a country with a
large excess of imports. This is the result of the great develop-
ment of German trade which has been going on since 1870, and
we may accordingly expect an increase of the excess of imports
to continue. Germany, it should be understood, is different from
France in this matter. It has now a much larger mercantile fleet
than France possesses, and it has a growing population full of
energy and spirit.

Coming next to the United States, we have to deal with a
country where there is commonly an excess of exports. This
was apparent in the discussion in 1882, and the characteristic
continues. In the last year of all the excess is in truth enormous,
being almost as remarkable on that side as is the excess of
imports into the United Kingdom on the other side. We find,
in fact, that the exports of merchandise and specie together in
the year ending 30th June, 1898, were 271 million £, while the
imports were 160 million £, the difference being no less a sum
than 111 million £. In merchandise alone the difference amounts
to 124 million £, which would have been the figure but for the
unusually large imports of bullion into the United States last
year. The proportion of the excess of exports amounts to no less
than 25 per cent. of the total trade of the United States.

These figures, however, can hardly be said to be normal. If
we look back we find that in some years the excess of exports
sinks to figures like 18 million £ and 13 million £, while we have
such a figure as 1,935,000*l.* in 1887, and we have actually an
excess of imports amounting to 8,525,000*l.* in 1888. The figures
are so irregular that it seems hardly possible even to give an

average, while it is also obvious that there is excessive irregularity in the exports of the United States themselves.   Although the total exports of merchandise last year were 256 millions, the amount three years before this—1895—was 168 million £ only. The irregularity when investigated appears to be largely due first of all to the changes in the harvest, and next to the great difference which is made by a difference in price like the rise in wheat which took place about eighteen months ago.   We can hardly infer therefore that an excess of exports in the United States amounting to 111 million £, represents a normal condition of affairs, although on the average, when we take long periods into account, there would appear to be usually an excess of from 20 million £ to 30 million £ annually.

There are obvious reasons why the United States should have an excess of exports.   In the first place the United States has to pay in its exports for the share of the carriage of goods in its foreign trade which is performed by foreign ships.   This is a very large figure.   In recent years the proportion of the imports and exports of the United States carried in foreign ships has ranged between 75 per cent. and 80 per cent., so that the United States is a country which has to pay other nations for the carriage of its goods in the foreign trade.   It may be mentioned by the way that the foreign country which does the carrying trade for the United States is mainly the United Kingdom, and, in this difference between the two countries accordingly we have, *pro tanto*, an explanation of the excess of imports in the case of the United Kingdom, and of the excess of exports in the case of the United States.   Next, the United States is a country which owes money in various ways to foreign nations.   There is an annual stream of American visitors to Europe, and there is an American colony permanently residing in Europe whose expenses have to be paid for.   More important still, a great deal of capital has been invested in the United States by Europeans,—by English people, by Dutch people and Belgians, as well as by French and Germans, not to speak of minor nationalities in Europe.   The interest on this debt has of course to be paid in exports, unless to the extent that in any given period re-investments are made in the United States. In these various ways then an excess of exports from the United States can be accounted for, and it may be questioned whether in recent years, when the excess of exports was so large, any great withdrawal of capital from the United States was in progress.

The excess of exports from the United States, it should also be noted, appears greater than it ought really to do, in consequence of the method of valuing the imports in the United States.   Here the valuation is not taken as at the place of arrival, which we

have assumed to be the more frequent practice among nations, but the goods imported are valued as at the place of shipment, and without any part of the cost of conveying them from the place of shipment to the port in the United States being added. Were an addition made on this account the excess of exports from the United States would be somewhat less than it appears to be.

There are indications of a change in the general position of the United States in the world as an importing and exporting country being not very far off. The circumstances are such that the United States are probably beginning or about to begin to diminish their indebtedness abroad, and gradually to take a part among the exporting nations which are even investing in other countries. They are also beginning to resume the business of ship-owning in the foreign trade, which will be another source of credit to them abroad. It will be of interest, therefore, during the next few years to watch the development of the United States, and to see whether in turn they will become one of those countries where there is a steady excess of imports over exports.

III.—*The Variations of Excess of Imports in Trade with Different Countries.*

To add to the information on the subject it may be desirable to make some inquiry as to the amount and proportion of the excess of imports which we have to consider, not merely in our trade with the world generally, but in our trade with particular countries. This is not with any idea that there ought to be the same sort of balance in our trade with every particular country. On the contrary, the true notion is, as was explained by Cobden long ago, that a nation in this matter is like an individual trades-man. A baker, or a butcher, or a shoemaker " exports " the particular goods which he produces to such customers as he can find, in order to obtain an income which he can spend in any way that he pleases. The butcher does not send his joints to the baker and the shoemaker with the expectation that he is to get an exact return from one or the other; and it is the same with these tradesmen, each in his own trade. So it is with nations. We send abroad such of our goods as we have a surplus of to those customers in foreign countries that desire to take our goods, and we mean to use the money thereby obtained to purchase whatever goods we require in the markets of the world generally. We send cotton goods to India, for instance, and coal to many places of the world, in order to obtain a fund with which we can buy wheat and other things from the United States and those countries which have wheat and the like articles to send to us,

those countries in turn buying from India and elsewhere the
articles of tropical produce which they require, and paying for
their purchases by drafts upon England against the wheat which
they have sent there. Still, in view of the fact especially that we
have so much interest to receive from abroad for which we make
no return, and that we have so much to receive in respect of the
work done by our ships in carrying goods and passengers which does
not figure as an export, it becomes interesting to notice what the
nature of our trade is, and in what different degrees there is an
excess of imports from particular countries, and to what countries,
in spite of our general excess of imports, we really show an excess
of exports in our trade with them.

The tables which are given in the Appendix (see Appendices
G, H, and I) help to answer the question. In these tables the
trade in merchandise is shown separately from the movements of
bullion, and a special table is also added for the trans-shipment
trade which is not required in the general tables above given, as
the trans-shipments in and out balance each other, but which is
necessary now, as we receive more from some countries for trans-
shipment than we send to them, and send more to others than we
receive from them. Our trade is shown separately with each
individual country, and in the merchandise tables these countries
are also divided into groups for convenience of reference.

Beginning with the merchandise tables, we find that in the first
group of all, that of the northern European countries, comprising
Russia, Sweden and Norway, Denmark and Iceland, Germany,
Holland and Belgium, in 1897 our imports from those countries
amounted to 124 million £, and our exports to 81 million £, the
result being an excess of imports from this group amounting
to 43 million £, which is in the proportion of more than 20 per
cent. to the total trade. In the trade with one of these countries
only—Germany—is there an excess of exports, the excess amount-
ing to nearly 6 million £, or about 10 per cent. of the total trade.
Still it would hardly be fair to take Germany separately in such a
question, as so much of our trade with Holland and Belgium is
really trade in transit to and from Germany.

The next group in the list is that of southern European
countries in which are comprised France, Portugal, Spain, Italy,
Austrian territories, Greece, Roumania, and Turkey. Here we
find that there is a still greater excess of imports in proportion.
The imports amount to about 84 million £, and the exports to
43 million £, the difference being 41 million £, which is in the
proportion of about 33 per cent. of the total trade. The greatest
excess is shown in the case of France, the excess amounting to
34 million £ in a total trade of 73 million £, or not very far from

one-half. The peculiarity of Italy in this group showing an excess of exports—that is, an excess of exports from this country to Italy—would seem to be accounted for in part by the possibility of certain portions of the trade with Italy being done through Germany, France, and other countries, and also by the fact that Italy is one of those places which receives a great many British tourists and a great many British residents.

The United States, group 5, is the next important country to mention in connection with the excess of imports. The excess here amounts to 75 million £ upon a total trade of 150 million £, again exactly one-half.

Among foreign countries besides, there are four smaller groups 3, 4, 6, and 7, which may be dismissed very briefly, as they are mainly countries to which there is an excess of exports, the aggregate trade, however, of all these groups being of less amount a good deal than that of the countries which have already been mentioned. In group 3, which is that of the foreign possessions of European countries, the imports are 3,382,000*l.*, the exports 5,156,000*l.*, the difference being 1,774,000*l.* In group 4, that of the Asiatic foreign countries, comprising Persia, Siam, China (exclusive of Hong Kong and Macao), and Japan, the imports amount to 4,413,000*l.* and the exports to 11,756,000*l.*, the difference being 7,342,000*l.* In group 6, which comprises the various countries on the American continent, excepting the United States and British possessions on that continent, we find that the imports amount to 16,868,000*l.* and the exports to 19,891,000*l.*, showing a very small excess of exports, which is also pretty evenly distributed. Finally, in group 7, which includes mainly minor foreign countries in Africa, we find that the imports amount to 11,300,000*l.* and the exports to 8,514,000*l.*, showing a net excess of imports of 2,786,000*l.* The excess of imports, however, entirely arises here in the trade with Egypt, and generally to all the countries in 3, 4, 6, and 7 the rule of an excess of exports from this country applies. In the aggregate our export trade to such countries, though relatively small, looking at the great volume of our foreign trade, is still important, amounting to about 45 million £, which is nearly one-sixth of our total export trade, and the aggregate excess of our exports in these cases amounts to about 9½ million £, while apart from Egypt it would amount to over 14 million £.

So far then it would seem that in our dealings with foreign countries we receive a large excess of imports from European countries and from the United States, while to the minor foreign countries we send an excess of exports very material in amount in proportion to our total trade with them.

There is placed together in a separate group our trade with British colonies and possessions. Here we find that the total imports amount to 94 million £ and the exports to 87 million £, showing a total excess of imports of 7 million £, which is very small in proportion to the total trade, implying a condition of things intermediate between that existing in our trade with European countries generally and the United States, and that existing in our trade with minor foreign countries. The excess of imports is much smaller than it is in the first case, and it contrasts with an excess of exports in the latter case. Looking further into the matter, however, we find that the indications geographically in the trade with British colonies and possessions are not different from those in the geographical arrangement with foreign countries. We find, in fact, that in our trade with British North America alone there is an excess of imports amounting to 13 million £, and on the average in the case of our other American colonies there is an excess of exports. One other important group with which there is an excess of imports is Australasia, which sends us 5,666,000*l.* more than we send to it. The country to which we send on balance the largest excess of exports is the Cape of Good Hope and Natal, but this may be explained in part by the fact that we are now dealing with merchandise only, the bullion table to be noticed presently showing an excess of imports, and by the fact already referred to, that in our trade with this region the import of diamonds, amounting to 4 million £, does not appear. The excess of imports in our trade with European countries and the United States would probably also be diminished *pro tanto* if we could include the export of diamonds to them and other articles which now escape registration. Perhaps the most interesting case of an excess of exports on a large scale is that of British India, from which in 1897 we received imports amounting to 24,813,000*l.*, and to which we sent exports amounting to 28,009,000*l.*, the difference or excess of exports amounting to 3,196,000*l.*, which is increased as we shall find presently if we include bullion.

Altogether putting foreign countries and the colonies together, we find that the excess of imports in our trade with countries where such an excess exists, amounts to no less a sum than 201,686,000*l.*, which is set off by an excess of exports in our trade with other countries amounting in all to 44,831,000*l.*, leaving a net excess of imports on balance of nearly 157,000,000*l.* The countries from which we receive the excess are mainly the European countries and North America, but we also find Australasia in the same category. Generally to the rest of the world we export more than we import.

This view is not substantially altered if we look at the figures of the trans-shipment trade. By the nature of the trade, as already explained, the total imports are identical with the exports, each amounting to about 11 million £; but in several important cases the excess of imports already noticed is increased. This is especially marked in our trade with France, where there is an excess of imports in the trans-shipment trade to be added to the large excess already noted, amounting to 3,707,000*l.* In the case of other countries, the effect of including the trans-shipment trade with them would be to diminish the excess of imports. This is particularly so as regards Australasia, the United States, and our North American colonies. To Australasia in the trans-shipment trade there is an excess of exports of 978,000*l.*; to British North America 410,000*l.*; and to the United States 3,181,000*l.* These amounts, though considerable, are not however very important relatively, looking to the magnitude of the excess of imports already stated. To British India it will be observed there is a small excess of exports in this trans-shipment trade, so that the excess of exports shown by the principal table is not affected.

The bullion table affects different countries very differently. We now find that in the case of Russia among European countries, the excess of imports is set off by an excess of exports of bullion amounting to nearly 7 million £, while to Germany, where in merchandise alone imports and exports nearly balance, there is an excess of bullion exports amounting to 12 million £. In the case of France among other European countries the excess of imports would however be increased by 1,538,000*l.* if we include the bullion. *Per contra* among European countries the excess of exports to Austrian territories would be increased by 4,205,000*l.* In the case of the United States the excess of imports we receive would be increased by no less than 8,931,000*l.*, a set off to the excess of exports in the trans-shipment trade, leaving the excess of imports shown in the main table comparatively unaffected. The principal other facts to notice appear here to be (1) the excess of imports of bullion from producing countries, viz., 3,050,000*l.* from Mexico and Central and South America, 13,593,000*l.* from British possessions in South Africa, and 10,546,000*l.* from Australasia, the two former balancing *pro tanto* the excess of exports to those countries already noticed, and the latter swelling the excess of imports, making altogether a very large excess of imports from Australasia; and (2) the excess of exports to India amounting to 7,659,000*l.*, which adds, as already stated, to the excess of exports generally already appearing in our trade with India. To Japan there is also a large excess of exports of bullion, which is no doubt connected with the special circumstances of that country recently as the receiver of

a large war indemnity which it uses to establish a gold standard.
Generally the bullion movements do not modify the main facts
to be explained by the excess of imports from European countries
and North America, and from Australasia, coupled with an excess
of exports to the minor countries of the world and to India.

The facts obviously suggest what has been already said as to
triangular trade. No one can suppose that some of the countries
to which we send a large excess of exports are less indebted to us,
both for services in connection with the carrying trade and for
interest on investments than other countries from which we
receive an excess of imports. India is a good case in point. The
excess of exports here, putting merchandise and bullion together,
exceeds 10 million £, although India is peculiarly an indebted
country to England and generally exports more than it imports.
As we are not making large new loans to India, though we are
lending a little, the explanation can only be that India pays us by
sending goods on our account to other countries from which we
import largely, and whom we pay by setting off our credit on India
against our debt to them. It is the same with other countries, but
India happens to be a good illustration.

Besides the fact of the triangularity of trade, however, the
facts also reinforce the applicability of the statements already
made as to the cause of the excess of imports generally into this
country. The countries from which we receive such excess are
either for the most part countries which are largely indebted to us
for carrying services, or countries indebted to us for interest or
both. As regards carrying services we have already mentioned
incidentally the amount of work done by foreign shipping, in the
trade of the United States ; but a more general comparison can be
made, not merely with reference to foreign shipping, but with
reference to British shipping, especially in the trade of certain
foreign countries. The following is such a comparison :—

Excess of Imports into the United Kingdom from the undermentioned
Countries, and Proportion of their Foreign Seagoing Trade carried on
in British Ships.

	Excess of Imports. In thousand £'s. [000's omitted.]	Proportion of Trade in British Ships.
	£	Per cnt.
Russia	10,415,	54·4
France	33,829,	45·6
United States	75,108,	56·1
Holland		53·4
Belgium	17,986,	—
Germany		35·5

The correspondence in the case of the United States is especially remarkable, and other facts of a like kind could be obtained if the trade of the world were to be examined minutely. Of course we do a great deal of carrying work for other countries, such as India, to which we send a large excess of exports; there is no exact correspondence between the excess of imports in given cases, and the fact that we do a large amount of conveyance for the countries concerned in such cases; but the indications are sufficient to show how material is this fact of the work done by our shipping in the trade with foreign countries.

It cannot be said that these remarks apply so much to the subject of interest received from abroad. A country like France for instance is clearly not indebted to England as the United States is supposed to be, though it is clearly a country for which we do carrying services. But the United States at least is largely indebted to us for interest, and so to some extent is a country like Russia, though it is not so much indebted as it once was.

The case of India appears to be so peculiar as to deserve a special remark. It is a country whose carrying trade is mostly done by British ships: it is largely indebted to the mother country both for interest and for salaries, annuities, and pensions. It is a typical country from which, other things being equal, we should expect to receive an excess of imports. But the contrary, as we have seen, is the case. The explanation can only be that the goods which India can export are suitable largely for the consumption of other countries than England, and the goods which it desires in return are goods which England produces and manufactures. India in fact sends opium, rice, silk, and other goods to Asiatic countries, and to France and other European countries, while its principal imports, apart from bullion, which comes to India mainly through England, consist of manufactured cotton goods, in whose manufacture Lancashire is pre-eminent. The special case of India then does not affect the general impression of the figures.

In consequence of the interest of the question, I have also added in the Appendix (see Appendices K to O) tables showing the excess of imports or exports in trade with particular countries in the case of France and the United States.

The case of France it will be seen is specially interesting. Like this country, France receives an excess of imports from the United States, though not on the scale that we receive, as the excess is 6 million £ only. It also receives an excess of imports from Russia and other countries, as we also do. But it sends a large excess of exports to the United Kingdom, corresponding, though not exactly, to the excess of imports we receive from it,

and an excess to Belgium and Germany. The triangular trade in the case of France, therefore, apart from the debt it owes to us for conveyance, is thus very largely a trade in which France, by exports to the United Kingdom, obtains the means of paying the debts which it incurs to the rest of the world for imports. How indispensable England is to France, as it is to many other countries, was shown in so striking a manner on a recent occasion, that no comment is needed. Cobden was not so wrong after all in his idea that free trade would bind foreign countries to us with chains it would be difficult to break.

With regard to the United States, the tables show that the country exports more than it imports, not merely to the United Kingdom, but to other European countries, mainly France, Germany, Belgium, and Holland. The United Kingdom, however, is so far the most important customer of the States, and, of course, in performing the carrying trade it becomes entitled to a share of what the United States sends to Europe. The United States as already explained is an indebted country, and part of its excess of exports is no doubt to pay its debts, but that cannot be the whole explanation. *Per contra* the United States has a large excess of imports from Brazil, China, the British and Dutch East Indies, and Japan, to which, as we have seen, the United Kingdom exports generally more than it imports—again an illustration of the triangular trade. The table also suggests an explanation in part of our own excess of imports from British North America, Canada being one of the countries to which the United States sends a large excess of exports. Canada thus obtains by its exports to the United Kingdom the means to pay for its imports from the United States.

The tables for France and the United States, therefore, taken from the returns of those countries, fully confirm the figures of the trade returns of the United Kingdom. The excess of imports exists in countries which have interest and charges for conveyance to receive, and especially in England, which is the most important creditor and the most important carrying country. But it also exists in part because countries like the United States, France, and most other countries send to us goods for which they find a better market here than elsewhere, and use the credit they obtain thereby with which to pay for their purchases throughout the world generally. Hence we have an excess of exports to countries like Brazil and British India, which is balanced in part by an excess of imports from those countries into the United States; and we have an excess of imports from Canada which is balanced by an excess of exports from the United States to Canada. An attentive student of the returns of the great countries of the

world in detail, observing the articles of the trade as well as its general course, would probably be able to supply a most interesting bird's eye view of the world's commerce—the nature of the exchanges, the area of the consumption of different articles, and the way in which the accounts are finally cleared and settled in Lombard Street. The principal features are, however, unmistakable, and should convince the most careless of the wide study that is required to follow the changing currents of trade and interpret the nature and causes of the changes.

IV.—*The Alleged Stationariness of our Exports.*

The remaining point of view from which it was proposed at the outset to examine the facts as to the excess of imports, is that of the connection of this fact with the stationariness or alleged stationariness of our exports themselves. There would not be so many expressions of alarm as we find now about the fact of an excess of imports, if it were not that it is supposed our exports are not maintained. Part of this alarm is based upon the idea that our trade is going down and that we are living on our capital, an idea which it seems hardly worth while to discuss formally after the facts stated in the early part of this paper ; but the idea is also entertained that the great importations we command because of our being creditors of foreign nations, and because of the services we render as carriers, impede the expansion of our export trade itself, as we obtain the goods we require from abroad in another way. Is our export trade really checked ? What will be the effect on it in the long run of a steady growth in the excess of imports, however natural and legitimate, and significant of a profitable condition of our trade, that excess may be ?

There seems good reason to doubt, to begin with, whether as yet there is any check to our export trade, when we examine all the facts carefully. There is an appearance of stationariness. The exports of British and Irish produce still range about 230 to 240 million £ per annum as they did ten years ago, and even long before that, in the booming years of the early seventies. But as I had the opportunity of explaining at a meeting of the Society as long ago as 1879, there may be such appearances without the reality. The decline which was then apparent was one of price only, and was accounted for very much by a fall in the value of the raw material previously imported included in the manufactured articles exported, there having been really an increase in the exports of the produce of British labour. So now when we compare quantities with values, and follow the facts as to principal articles, we find the condition of our export trade by no means so

stationary generally as the first figures on the surface would appear to show. Let us analyse the facts.

The apparent stationariness, taking the most general figures, and handling them in a proper manner, is not what is popularly supposed. Taking the average of the three years ending 1897, and comparing this with similar periods, ten, twenty, thirty, and forty years before, we find that all through there is an increase, and that the only sign of stationariness is an increase at a less rate in the last periods than in the earlier periods. The comparison is :—

Average Annual Exports from the United Kingdom in the undermentioned Periods compared, showing also the Amount and Percentage of Increase between each Period.*

[In millions of £'s.]

	Total Exports.	Increase on Previous Period.	
		Amount.	Per Cent.
	£	£	
1855–57	134,	—	—
'65–67	228,	94,	70
'75–77	264,	36,	16
'85–87	274,	10,	4
'95–97	292,	18,	$6\frac{1}{2}$

* These are the total exports, including foreign and colonial as well as British and Irish produce.

Thus there is no question of an actual decrease even comparing values only if we take long periods into account. It is obvious also that the increase in the earlier periods must have been quite abnormal, even allowing for the fact of a great enhancement of values due to the general rise of prices following on the Australian and Californian gold discoveries. The significant feature in the increase in the last two periods is that it is at a less rate than the increase of population in the interval, so that if the figures were a perfect indication of the growth of the exports of the produce of British labour, we should be able to say that these exports were not keeping pace with the growth of British industry in other directions.

The real increase, however, is at a greater rate than the figures show. 1. When we look at particular trades we find more than one instance of a great increase both in quantity and value during the last twenty years.

Quantity and Value of the Exports of the undermentioned Articles of British Produce in 1877 *and* 1897 *compared.*

QUANTITY.

	1877.	1897.	Increased Amount.	Per Cent.
Coal............................ mln. tons	15	37	22	146
Cotton thread, for sewing............... „ lbs.	11	26	15	136
Grease, tallow, and animal fat .... thsnd. cwts.	133	643	510	383
Jute yarn .... mln. lbs.	15	52	37	246
Steel and manufactures of steel .... thsnd. tons	35	345	310	886
Oil and floor cloth ... mln. yards	5	24	19	380
Spirits......................... thsnd. galls.	1,530	4,652	3,122	203
Wool, &c. .... mln. lbs.	18	95	77	428

VALUE.   [In thousands of £'s.]

	£	£	£	
Coal..	7,844,	16,654,	8,810,	112
Products of coal.............................	507,	1,667,	1,160,	229
Cotton thread for sewing...............	1,801,	3,321,	1,520,	84
Cycles	not separately stated	1,430,	—	—
Fish..	1,345,	2,036,	691,	51
Grease, &c.......................................	193,	575,	382,	198
Implements, &c................................	406,	1,364,	958,	236
Jute yarn	217,	526,	309,	142
Machinery, not steam engines........	4,704,	12,157,	7,453,	158
Steel and manufactures of steel ...	1,525,	3,745,	2,220,	146
Oil and floor cloth..........................	317,	1,042,	725,	229
Miscellaneous provisions	775,	1,084,	309,	40
Sewing machines	not separately stated	1,074,	—	—
Spirits...	374,	1,844,	1,470,	393
Wool, &c.	955,	4,034,	3,079,	322

It will of course be understood that this is a comparison of articles in our foreign export trade where there has been a considerable increase, in some cases a very great increase, in the last twenty years. It is only intended to show that there is no little vigour in certain departments of our export trade, and that we must not judge it exclusively by other departments, especially the textile branches, where there is a decrease or only a slight increase in value.

2. Some branches of our export trade again in the period in question are still affected by the fall in the price of the raw material previously imported which is contained in the exports. This is conspicuously the case in cotton piece goods. Here the increase in quantity is from 3,837 million yards to 4,792 million

yards, an increase of about 25 per cent. in twenty years, but the fall in value is from $52\frac{1}{2}$ million £ to 46 million £, or 10 per cent. The explanation is that raw cotton has fallen in the interval from about $3l.$ per cwt. to about $2l.$ per cwt., or 30 per cent. Assuming that the raw material was formerly half the value exported, or say in 1877 26 million £, a reduction of that percentage in the latter amount would alone more than account for the reduction in the value of our exports of our cotton manufactures. The same with our woollen manufactures. The total value is reduced in the twenty years from about 18 million £ to 16 million £. But the reduction in the average value of wool imported is from $14d.$ or more to $8d.$ per lb., or more than one-third, and allowing this reduction to apply to one-half the contents of our exports of woollen manufactures, this would more than account for the reduction in the total exports, without any real reduction in the exports of British production contained in these manufactures.

Admitting then a check to the exports of our manufactures in certain directions, we have in the above facts of vigorous growth in other directions, and in the evidence that part of the decline is nominal only and not real, sufficient ground for doubting whether the assumption that our export trade has become stationary is justified. At most, it appears to me, the evidence only goes to show that an abnormal rate of growth prior to a period about twenty years ago has not been continued, and that there is still an increase from period to period which is not really unsatisfactory in amount.

Such being the facts, it is perhaps unnecessary to inquire as yet into the effects of an increase of our excess of imports in checking the expansion of our export trade, inasmuch as that expansion still continues. But the slower rate of increase and certain theoretical considerations appear to justify us in not entirely passing over the question. If the two things are not unconnected, then the slower rate of increase may be an indication of a greater change still being at hand. Is there really a tide in the export trade ? and is the turn of the tide approaching, though it may not have actually come ?

Answering these questions, we may say at the outset that there is no reason why a check to our export trade should not come without our prosperity thereby diminishing. The main exchanges in almost any community, the main production and consumption, are necessarily internal. Even in a country like England only a portion of the whole income of the people is derived from foreign exports—a portion which I estimated many years ago at from a sixth to an eighth only of our own aggregate income ; and this would still appear to be a fair estimate if we exclude what we earn by our carrying trade. If from any cause that branch of our

industry should be diminished, it is surely quite possible that the diminution may be compensated by a simultaneous increase of the other five-sixths of our production. The only difference would be that we should do more at home and exchange less abroad. Why not? The assumption that in diminishing our transactions with foreigners we necessarily diminish our transactions altogether is entirely unwarranted, both theoretically and practically. We see even in our foreign trade how much the descriptions of goods which we produce for export change from period to period. It is no violent assumption that the change may go further, and that instead of certain of our producers making articles for export with which to buy abroad something we require, they may produce directly something we require at home.

The effect then of an excess of imports, arising either from the remittance of interest home on capital invested abroad, or in payment for services we render as carriers, must apparently be *pro tanto* to produce that very condition of things which will diminish the stimulus to our export trade. We get so far what we want from abroad in other ways, and therefore we do not require to export, and to make for export, so much as we should otherwise do. As the excess of imports increases also the condition becomes more and more unfavourable to an increase of our export trade. We get more and more of the sort of things we do want from the foreigner without exporting or making for export. Unless the nature of the articles which the foreigner produces should itself change greatly, the presumption is that, other things being equal, the change must tell, and that we shall export less in proportion as the excess of imports increases. Professor Marshall, in a recent letter to the " Times," laid great stress on the probability of the population of the United Kingdom being "saturated" with some sorts of produce, so that their new wants were more likely to be supplied at home and to give rise to demands for home production of some kinds.

It should be understood, however, that in all this there is no more than a presumption. In a given case, at a given period in economic history, the foreigner may develop some new production of an article we fancy, or the production at greatly diminished cost of some articles we would gladly take more of. In such a case the stimulus to our export trade would remain as before, notwithstanding the excess of imports. We cannot tell beforehand. We can only say that the presumption is the other way.

There is another mode also in which the exports may still be stimulated. We may re-invest the income due to us without bringing it home, and may increase our capital commitments abroad in other ways. But in this case the effect would also be

to diminish the excess of imports *pro tanto*, as we must believe it is in fact diminished in some years, when we find on looking over the figures that there is no year of a maximum excess of imports in which we have received all that is due to us, while in other years, as we received so much less, we must have been making new advances abroad at least to the amount of that difference. *This* stimulus to our export trade has thus not been wanting during the last few years. So long as it exists causes will be at work to limit the effect of any check to the expansion of our exports which is likely to be given by the fact that we have so much to receive from foreign countries in other ways.

It is not within the precise scope of my subject to discuss the whole question of a check to our export trade, I am only discussing it with reference to the question of the excess of imports; but having dealt with the subject at all, I may be permitted to add a few remarks of a more general kind.

There is one reason then on the surface of the facts why the exports of a country like England should not increase so rapidly as formerly, even if they are not checked, and that is the great diminution of the purchasing power of our foreign customers occasioned by the fall of prices. The most conspicuous reductions of prices occurred more than ten years ago, but the previous fall was not recovered from for many years. It is only quite lately that there are indications of a turn in the opposite direction. Such a fall could not happen without making all our foreign customers poorer. India, the Argentine Republic, the United States, Russia, and many more countries all felt the blow, having to send more and more produce to pay the same debt. But for the mitigation of the evil by the credit which England extended, the consequences must have been even more serious than they have been; but that they have been serious, and continue to be serious, is beyond all question. The change is on the whole advantageous for this country. The foreign market being limited by the limitation of the purchasing power of our customers, we have used the surplus arising from our receipt of so much from abroad at lower prices to add to our comforts and enjoyments of home production, and so there has been a simultaneous development of our home business which more than compensates the comparative arrest of our foreign exports. But it is the diminution of the purchasing power of our foreign customers, because they are sending us more produce for less money, which helps so much to make the change. We gain at their expense, whatever the cause of the lower prices may be. Of course they gain on the goods we do send them, which also go out at lower prices, but then the condition is that having to pay debts to us, they have more

to send than to receive, and the balance is accordingly all in our favour.

The other remark I have to make is on the allegation that foreign nations are taking away our export trade from us, the countries particularly mentioned being the United States and Germany. France, as we have already seen, though it is sometimes mentioned in the matter, does not really count, as its foreign exports are more checked than our own. With regard to the United States then, the obvious reply is that that country does not interfere with our export trade to any sensible extent in competition in third countries. Great as the increase of United States' exports as yet is, the exports are mainly of the goods which we and other European countries buy from the United States and like countries, and not of the goods we sell to them. The increase of United States' exports therefore is a cause for satisfaction to us in its bearing on our own trade, though the irregularity of the business forbids us to hope that these large exports will continue. In time the United States is likely enough to be a competitor in neutral markets, but this competition is not as yet a marked feature of United States' exports. With regard to Germany the conditions are different, as Germany is a manufacturing power of the same general character as England. There is no doubt also that Germany has to some extent taken the place which we held in some articles in some markets, and threatens competition generally. But this is the characteristic nevertheless of a portion only of the foreign trade of Germany, which finds in England itself one of its best customers, and has as yet not so very great an outlet in the neutral markets where we are in competition. Having regard to the history of the growth of our own foreign trade also, we need not be surprised at Germany increasing its foreign trade so rapidly as it has done, while it is a comparatively new beginner in foreign enterprises. It does not follow that at a later stage it will not be subject to the influences which have given us an excess of imports, and stimulated the development of our home trade.

V.—*General Observations.*

In dealing with the excess of imports there are various points as to the course of our foreign trade in recent years which have necessarily come under notice, but which appear to deserve consideration also from a different point of view than that of this special question.

One cannot but be struck by the incessant changes that are going on in the nature of our foreign trade. It is one thing at one period, another thing at another period; and a few years

suffice to make a great transformation. Probably this has always been the rule. At one time in the history of our foreign trade the export of raw wool, to use a common phrase, was king ; at a later, the export of woollen manufactures; at a later still, the export of cotton manufactures; and last of all, about twenty or thirty years ago, the export of iron and iron manufactures. What we see in the recent history is that other things than those mentioned have lately been developing the most rapidly. Coal and other articles have been exported more largely than ever before, and they occupy a larger proportionate place in our export lists. Some entirely new articles, such as cycles, appear in these lists for the first time. At the same time our shipping fleet, whose work, as we have seen, is an export in a special form, has developed prodigiously. Coal and shipping together, we may say, now occupy a chief place such as was formerly held by wool, then by woollen manufactures, then by cotton manufactures, and then by iron and iron manufactures.

There are of course similar changes in our imports. We have been disproportionately increasing our imports of food articles for many years, and the raw materials we import have been changing Jute, for instance, is a comparatively new article. Iron ore is a still newer article, the whole increase having taken place in this article almost within the last twenty years.

Although also the proportions of our foreign trade with foreign countries and British possessions respectively do not change much, there are changes in the case of particular countries of great interest. I would refer especially to the way in which the Cape colonies have come to the front in the last twenty years, compensating the falling off in our trade with a country like China, which, apart from other causes, has lost in purchasing power by the competition of other countries in regard to tea.

There is accordingly incessant change going on in our foreign trade. The conclusion to be drawn is that only a general survey can suffice to tell us how our business is going on. There may be changes in some directions, apparently of an adverse kind, but it is obvious that in a widely extended trade with constant changes going on there must be some adverse changes in detail, to permit of room for the changes of an opposite kind in other directions. Uniform expansion is practically impossible in a changing world. We must be content if, on the whole, there is advance.

This leads me to suggest that some of the recent complaints as to the falling off of our foreign exports in certain directions, and the causes of it, may not be quite well founded. We hear a great deal from many quarters, in consular reports and other publications, of the apathy of English merchants and manufacturers, by

which they lose custom in certain of the markets to which our exports have been sent. We hear incessant sermons in the press and elsewhere, to the effect that our merchants and manufacturers must bestir themselves or we shall lose our foreign trade. In the occasion for such sermonising we should not altogether believe, although we may be unwilling to say anything to weaken the force of incitements to energy and industry on the part of our traders. One reason for disbelief is that in all these complaints we simply hear one side, and we do not hear the statements of the particular traders and manufacturers who are said to be losing the trade, on the other side. The whole history of English commerce has also been one of undoubted activity and energy on the part of those engaged. As Mr. Bagehot says in his "Lombard Street," part of our success has been due to the democratic structure of English commerce, which has given a fair field to energy and capacity. May not the explanation of many of these complaints then be in part, that as our trade cannot develop equally in all directions, our merchants and manufacturers have let slip the trade in certain directions where they could not maintain the rates of wages and profit which they were earning in other directions? This would explain what is the undoubted fact, viz.: the increase of our trade generally, taking home and foreign trade together, and the failure to compete in certain special directions, and would supplement the information derived from the foreign customers who complain of the want of elasticity and go among the English merchants and manufacturers from whom they would prefer to buy if they could. This explanation may not cover the whole of the complaints referred to, but I am quite sure that these complaints, when fully investigated, will be explained in part in some such manner. Many such changes must always be occurring in a widely extended trade, and we can only prevent false conclusions being drawn by looking at the subject as a whole, and not at one or two details merely.

If we could answer it, it would be an interesting question to ask, what is to be the direction of our foreign trade in future, perhaps of our trade generally? To such a question of course no one would pretend to make a complete answer. It may be doubted if any one, for instance, would have been able to predict twenty years ago the special development of South Africa which has occurred. Even those who knew most of the special resources of that region could not have been sure beforehand how far political and other circumstances would permit the development which has since occurred. No one also could have ventured twenty years ago to predict the immense development of our shipping in free competition with all the world which has since

taken place. The same chances remain for the future. Perhaps in Central Africa the experience of South Africa may be repeated —perhaps in Canadian territory, in Klondyke, or elsewhere. Possibly some other country may grow into prominence in our foreign trade. There is no use predicting or attempting to predict in such a matter. There may also be forms of activity like the further development of electrical energy which may give a new direction to our industries. Possibly there may be adverse changes in store for us in connection with such a business, as that of the export of coal, which we now send away from this country to the extent of 40 million tons per annum, in addition to 11 or 12 million tons shipped as bunker coal on board steamers. One of the recent features of the coal trade, as far as the export is concerned, has been the gradual limitation of the range of these coal exports themselves owing to the supply and competition of distant coalfields. It seems likely enough at no very distant future that the opportunities for exporting coal which we now have will continue to diminish. At the same time it may be many years yet before the actual export of coal will itself diminish, notwithstanding the diminution of the area to which it can be exported, and therefore we cannot say as yet that the recent direction which has been given to our export trade will certainly be changed.

We may say, however, that to all appearance, whatever form may be given to our industrial energies in the near future, it is by no means certain that the external trade of this country and that of the leading countries of the world is going to develop so rapidly in the future as in the past. There is a constant play between home and foreign trade, and the development in one generation in one branch of business is not followed as a matter of course by a continuance of the like development. The external trade also has apparently natural limitations. The chief foreign trade of the great nations of the world is already with each other and not with the outlying nations. It is quite impossible in the nature of things that the latter can develop so quickly as to materially affect the growth of the foreign trade of countries like our own, or France, or Germany. The purchasing power abroad of the inhabitants of India or China is very limited indeed, and cannot increase quickly. As nations advance, again, the proportion of the exchanges which are necessarily local in their nature appears rather to increase. These local exchanges are also by far the most important in every country, and all that I am noticing here is that the increase of civilisation, while it may increase the foreign trade in the aggregate, does not necessarily increase the proportion of that foreign trade to the whole business. It would be useless

to make any predictions, but we may affirm that the constant assumption of the relative importance of foreign trade at all times and places does not appear to be well founded. It may or may not be that foreign trade will develop specially in future, although trade generally, including both home and foreign trade, is certain to increase largely as inventions and the use of machinery continue to increase.

In any case, whatever may seem to be the most reasonable conclusion as to the future, our last word must be the importance of a general survey of trade, including both home and foreign, before any opinion can be justified to the effect that a decline of English trade generally has begun or is at hand. Many changes lie before us, but if there is to be decline we shall have very different symptoms to deal with from any that are yet manifest. I do not believe in decline, for the simple reason that with abundant capital and energy people can exchange with each other indefinitely, can make and consume what they most require; and to a country like England, with a large credit in foreign countries to begin with, this would be sufficient to insure all that they can want from abroad and ample prosperity at home. There is no dependence in such a country on any special conditions, because the time has gone past when people are obliged to live where their food and raw materials are grown. If there is to be decline, then, it will be our own fault and supineness, and not any lack of the conditions and the opportunity to advance.

VI.—*Summary.*

The principal conclusions and statements of the foregoing paper may be summarised as follows :—

1. The excess of imports into this country is neither singular nor novel. As was shown in the paper read at the Statistical Society on the use of import and export statistics in March, 1882, there is on balance an excess of imports when the imports and exports of the different countries of the world are added together. This is the result of the usual method of valuing the imports and exports—the former at the place of arrival, and the latter at the place of departure—so that as the exports of one country become the imports into another, the aggregate imports have necessarily added to them the cost of conveyance from the country which they left, and they are consequently larger by so much than the aggregate exports. It is not singular, therefore, that a country like the United Kingdom should show an excess of imports. The excess is also not a new thing in our case, because, since the year 1854, from which date exact comparisons can be made, we know that there has been uniformly an excess of imports

and an increasing excess, the amount rising from 37 million £ on the average of the three years 1854-56, to about 120 million £ on the average of the three years 1878-80, and to 140 million £ on the average of the three years 1893-95. The average at the present time is probably still higher—about 160 million £; but there are great fluctuations, and the actual figure when the average of a few years comes to be taken may be a little different.

2. The excess of imports is subject to great fluctuations like the imports and exports themselves. Although the figure of 120 million £ was reached about 1878-80, this being the figure which was dealt with in the paper read in 1882, the amount fell to 91 million £ on the average of the three years 1884-86, and to 95 million £ on the average of the three years 1887-89, the figure in 1886 being also as low as 80 million £, and in 1887 82 million £. The tendency apparently is for the excess of imports to increase in years when the credit of foreign countries or British possessions decreases, and *vice versâ.* But from whatever cause the variations arise, it is obvious that this is one of those cases where long averages must be looked at in order to arrive at a true impression of the facts.

3. The excess of imports is to be accounted for in the trade of a country like England in several ways, principally by the fact that England is a shipowning country, and does a large business all over the world in carrying goods and passengers. This work is really in itself in the nature of an export, giving the country a credit for so much in its dealings with other countries. In addition, England is a country which earns largely commissions of different kinds in its trade with different countries as the commercial and monetary centre of the world's trade. Last of all, England is one of the countries which has become entitled to the receipt of large interest and profits from other countries on account of capital which it has invested, and business which it carries on, in such countries, including the sums receivable by English subjects in the service of a dependency like India. In these various ways it is not difficult to compute that very large sums are receivable by this country which entitle it to an excess of imports in its trade with other countries.

4. In the paper of 1882 it was estimated that the sums so receivable were about 60 million £ annually for the earnings of ships, about 16 million £ annually for commissions, and from 70 million £ to 75 million £ annually for interest and profits. The corresponding figures now are estimated to have increased the earnings of ships to over 70 million £, commissions to 18 million £, and interest and profits probably to about 90 million £, though the nature of the data is such that no exact statements can be made.

5. With regard to the earnings of ships, it is pointed out that the increase allowed for is very much less than the increase in the magnitude of the shipping fleet itself. In 1882 the calculation was that the shipping fleet consisted of 4 million tons of sailing ships, and $2\frac{1}{2}$ million tons of steamers, the equivalent in sailing tons of the steamers being considered to be 10 millions, making the total in all 14 million tons. At the present time the shipping fleet consists of a smaller number of sailing tonnage, the number of tons being now only $2\frac{1}{3}$ million. But the number of steam tons has increased to $6\frac{1}{2}$ millions, equivalent on the former computation to 26 million tons, and making the total of the fleet at the present time in the equivalent of sailing tonnage over 28 million tons, or double what the figure was eighteen years ago. If the earnings of the ships had increased proportionately to what they were in 1882, the figure would now be 110 million £, as compared with an amount between 70 and 80 million £ above estimated. Along with the increase of steam tonnage, however, there has been a great increase in efficiency and diminution in the cost of construction and working, resulting in a great reduction of freights, and it is not possible to estimate that the gross earnings have increased in proportion to the increase of the fleet itself. The estimate finally arrived at is between 70 and 80 millions.

6. Increase in interest and profits receivable from abroad is evident, first of all, in the recorded increase appearing in the income tax returns, which is from about 28 million £ in 1880 to 56 million £ in the last year for which the income tax returns have been published. The figures thus apparent do not show the whole income received in this country from abroad, but we may argue from the increase in the known and visible income, that there has also been a large increase in the income which cannot be traced in the income tax returns, but which is undoubtedly receivable from abroad. Since 1880, while there have been some conspicuous defaults in foreign countries and conversions of debt reducing the interest payable, there has also on the other hand been a great and sudden increase of profits from countries like South Africa and West Australia, and this confirms the idea that there has been a great increase of the income due to this country from abroad in the last sixteen or eighteen years.

7. Looking to foreign countries, it is found that France and Germany are both countries with an excess of imports, but in France this has diminished in the course of the last sixteen years. The explanation is, no doubt, that France differs from the United Kingdom in not having a large and increasing mercantile fleet, and also in having a stationary population, so that the imports into

France have not the same cause of increase as they have in England, and the real increase that may have occurred is concealed by the fall of prices in the interval. Germany, on the other hand, appears to be a country in which the excess of imports has lately commenced, and is likely enough to increase. In the United States, on the contrary, there is a great excess of exports, which has increased very much during the last year or two. This excess of exports is accounted for in various ways, principally by the fact that the United States is both an indebted country, so that it has interest to remit to European countries, and also that it has to pay, principally to England, for the conveyance of goods and passengers in the foreign trade. The nominal excess is also greater than it would otherwise be in consequence of imports in the United States being valued not at the place of arrival, but at the place of departure, so that the imports do not appear so large as they really are. The excess of exports in the United States is also very fluctuating, great changes arising it appears from the changes in the harvest surplus available for export and from the changes in the price at which that surplus can be sold. A rise in wheat which took place eighteen months ago has had a great influence in swelling the momentary excess of exports from the United States.

8. Examining the returns in detail so as to show in what trades the excess of imports is greatest, we find that in the case of the United Kingdom the excess of imports is mainly from European countries, principally France, from the United States, and from British North America; also to some extent from Australia. This appears to correspond with the suggestion that the two causes of the excess of imports are the indebtedness of foreign countries and the fact that they have to pay us for the conveyance of goods and passengers in our ships. The United States, as we have seen, is notoriously an indebted country, and both the United States and the various European countries are countries for which we do a large amount of conveyance, as is evidenced from their own returns showing the proportion of the British flag in the entries and clearances of ships in those countries. This cannot be the sole explanation, however, and it is further evident upon an analysis of the returns that there are various countries to which we send an excess of exports, countries like Brazil and India for instance, and these are countries again from which countries like the United States and France receive an excess of imports. All this indicates the existence of what is known as a triangular trade, so that the United States and the like countries send us really an excess of exports in order to pay for the excess of imports they receive

from other countries, the differences being finally adjusted in
Lombard Street.   There is no reason why there should not be a
special excess of imports or exports in our trade with particular
countries apart from the amount of that excess in our trade
generally.

9. The excess of imports, it has been suggested, may be a
cause for the stationariness or alleged stationariness of our
exports themselves, but it is found on examination that although
our exports of late years have not increased as they did in the
ten years between 1857 and 1867, or the following ten years, yet
they have always been increasing when we take a long period
into consideration, and when we allow for the great changes
caused by the fall of prices, which affect our export trade by
diminishing the value of the raw material previously imported
which is contained in the manufactures that we export.   Appa-
rently, however, the tendency of the permanent condition of our
trade, viz., that we receive, or are entitled to receive, large
interest from foreign nations, is a condition likely to make our
exports less than they would otherwise be, because we receive so
much from foreign countries without having to give any com-
mercial equivalent.   The purchasing power of foreign countries
would also seem to have been affected very seriously by the fall of
prices which has taken place during the last thirty years, as it
has diminished their ability to pay their debts, and left them a
smaller surplus for other things.   As the result, there has been a
great development of our home trade, which has taken the place
of the development of trade for export which might otherwise
have occurred.

10. Looking at our trade more generally, apart from the
question of excess of imports, the facts and statements brought
under review have shown that incessant changes have been going
on in the nature of our foreign trade.   Coal and other articles have
been exported more largely than ever before, and they occupy a
larger proportionate place in the export lists.   At the same time
the shipping fleet, whose work, as we have seen, is an export in
a special form, has developed prodigiously.   Coal and shipping
together thus occupy a chief place such as was formerly held by
wool, then by woollen manufactures, then by cotton manufactures,
and then by iron and iron manufactures.   Other changes have
also taken place in our foreign trade, such as the great develop-
ment of business with South Africa.   The conclusion to be drawn
is that only a general survey could suffice to tell us how our
business is going on.   There may be changes in some directions
apparently of an adverse kind, but it is obvious that in a widely
extended trade, with constant changes going on, there must be

some adverse changes in detail to permit of room for the change of an opposite kind in other directions.

11. This leads to the suggestion that some of the complaints as to the falling off of our foreign exports in certain directions and the causes of it, may not be quite well founded. May not the explanation of many of these complaints be in part that as our trade cannot develop equally in all directions, our merchants and manufacturers have let slip the trade in certain directions where they could not maintain the rates of wages and profit which they were earning in other directions? Their energy and capacity generally have, however, not failed them, as is witnessed by the general prosperity of the country. Many such changes must always be occurring in a widely extended trade, and we can only prevent false conclusions being drawn by looking at the subject as a whole, and not at one or two details merely.

12. Without attempting to predict what the future course of trade will be, it is pointed out that the increase of civilisation, while it may increase the foreign trade in the aggregate, does not necessarily increase the proportion of that foreign trade to the whole business of the country. It may or may not be the foreign trade that will develop specially in future, although trade generally, including both home and foreign, is certain to increase largely as inventions and the use of machinery continue to increase. Without a general survey of trade, no opinion can be justified to the effect that a decline of English trade generally has begun or is at hand. The decline appears improbable, because with abundant capital and energy people can exchange with each other indefinitely, can make and consume what they most require, and to a country like England, with a large credit in foreign countries, this would be sufficient to insure all that they can want from abroad and ample prosperity at home.

APPENDIX.

TABLE A.—*Statement showing the Total Imports and Exports of the United Kingdom, including Bullion and Specie, but not the Trans-shipment Trade, with the Excess of Imports over Exports, and Proportion of the Excess to the Total Imports and Exports, in each Year since 1854 inclusive.**

[In millions of £'s.]

	Total Imports and Exports, including Bullion and Specie.	Total Imports.			Exports.			Excess of Imports.	
		Mer-chan-dise.	Bullion.	Total.	Mer-chan-dise.	Bullion.	Total.	Amount.	Per Cent. of Col. 1.
	£	£	£	£	£	£	£	£	
1854	318	152	27†	179‡	116	23	139	40	12·6
'55	307	144	27†	171‡	117	19	136	35	11·4
'56	364	173	27†	200‡	139	25	164	36	9·9
'57	395	188	27†	215‡	146	34	180	35	8·9
'58	354	165	29	194	140	· 20	160	34	9·6
'59	408	179	37	216	156	36	192	24	5·9
1860	425	211	23	234	165	26	191	43	10·1
'61	417	217	19	236	160	21	181	55	13·2
'62	453	226	32	258	166	29	195	63	13·9
'63	503	249	30	279	197	27	224	55	10·9
'64	539	275	28	303	213	23	236	67	12·4
'65	526	271	21	292	219	15	234	58	11·0
'66	590	295	34	329	239	22	261	68	11·5

* It is greatly to be regretted that in making up the foregoing table actual figures for the imports of bullion before 1858 cannot be obtained, the imports of bullion prior to 1858 not having been recorded at the Custom House. In making up the foregoing table I have assumed that the average imports would bear the same relation to the average exports which it did in the four following years; but so far as I can judge, this is to understate the imports, as the coinage of the four years 1854-57 inclusive was 25 million £, as compared with a coinage of 16 million £ only in the four following years. The presumption is therefore that the home consumption of bullion in 1854-57 was greater than in the four following years, and the excess of imports would be correspondingly greater; in other words the whole excess of imports, bullion and merchandise together, was probably greater in 1854-57 than it appears in the text, and the proportion of that excess to the total trade would also be greater.

† Estimated, imports of bullion being recorded since 1858 only.

‡ Part estimated. As regards bullion imports see previous note.

TABLE A.—*Total Imports and Exports of the United Kingdom—Contd.*

[In millions of £'s.]

	Total Imports and Exports, including Bullion and Specie.	Total Imports.			Exports.			Excess of Imports.	
		Mer-chan-dise.	Bullion.	Total.	Mer-chan-dise.	Bullion.	Total.	Amount.	Per Cent. of Col. 1.
	£	£	£	£	£	£	£	£	
1867	539	275	24	299	226	14	240	59	10·9
'68	568	295	25	320	228	20	248	72	12·7
'69	569	295	21	316	237	16	253	63	11·1
1870	595	303	29	332	244	19	263	69	11·6
'71	687	331	38	369	284	34	318	51	7·4
'72	730	355	30	385	315	30	345	40	5·5
'73	745	371	34	405	311	29	340	65	8·7
'74	721	370	30	400	298	23	321	79	11·0
'75	717	374	33	407	282	28	310	97	13·5
'76	698	375	37	412	257	29	286	126	18·1
'77	723	394	37	431	252	40	292	139	19·2
'78	673	369	32	401	245	27	272	129	19·2
'79	665	363	24	387	249	29	278	109	16·4
1880	732	411	16	427	286	19	305	122	16·7
'81	734	397	17	414	297	23	320	94	12·8
'82	765	413	24	437	307	21	328	109	14·2
'83	765	427	17	444	305	16	321	123	16·1
'84	728	390	20	410	296	22	318	92	12·6
'85	686	371	22	393	271	22	293	100	14·6
'86	660	350	20	370	269	21	290	80	12·1
'87	678	362	18	380	281	17	298	82	12·1
'88	732	388	22	410	299	23	322	88	12·0
'89	796	428	27	455	316	25	341	114	14·3
1890	808	421	34	455	328	25	353	102	12·6
'91	821	435	40	475	309	37	346	129	15·7
'92	777	424	32	456	292	29	321	135	17·4
'93	752	405	37	442	277	33	310	132	17·6
'94	749	408	39	447	274	28	302	145	19·4
'95	782	417	47	464	286	32	318	146	18·7
'96	822	442	39	481	296	45	341	140	17·0
'97	844	451	49	500	294	50	344	156	18·5
'98	875	471	58	529	294	52	346	183	20·9

TABLE B.—*Statement of the Foreign Trade of the United States, showing the Excess of Imports over Exports.*

(a.) *Total Value of Imports into the United States in each Year, from 1860 to 1898.*

[In thousands of £'s.]

Years (ended 30th June).	General Merchandise.	Bullion and Specie.	Total.
	£	£	£
1860	73,673,	1,781,	75,454,
'61	60,272,	6,732,	67,004,
'62	39,449,	3,420,	42,869,
'63	50,695,	1,997,	52,692,
'64	65,926,	2,732,	68,658,
'65	49,738,	2,044,	51,782,
'66	90,586,	2,229,	92,815,
'67	82,451,	4,598,	87,049,
'68	74,469,	2,956,	77,425,
'69	86,980,	4,127,	91,107,
1870	90,825,	5,504,	96,329,
'71	108,380,	4,431,	112,811,
'72	130,541,	2,863,	133,404,
'73	133,778,	4,475,	138,253,
'74	118,209,	5,928,	124,137,
'75	111,043,	4,354,	115,397,
'76	95,988,	3,320,	99,308,
'77	94,026,	8,494,	102,520,
'78	91,052,	6,213,	97,265,
'79	92,870,	4,228,	97,098,
1880	139,157,	19,382,	158,539,
'81	133,889,	23,036,	156,925,
'82	150,967,	8,848,	159,815,
'83	150,663,	5,935,	156,598,
'84	139,104,	7,797,	146,901,
'85	120,318,	9,009,	129,327,
'86	132,382,	8,040,	140,422,
'87	144,233,	12,536,	154,769,
'88	150,824,	12,362,	163,186,
'89	155,236,	6,034,	161,270,
		7,078,	171,518,
1890	164,440,	—	—
'91	176,024,	7,554,	183,578,
'92	172,375,	14,511,	186,886,
'93	180,500,	9,243,	189,743,
'94	136,457,	17,862,	154,319,
'95	152,494,	11,791,	164,285,
'96	162,443,	12,980,	175,423,
'97	159,319,	24,072,	183,391,
'98	128,334,	31,524,	159,858,

TABLE B *Contd.—Statement of the Foreign Trade of the United States.*

(b.) *Total Value of Exports from the United States in each Year, from* 1860 *to* 1898; *with Excess of Imports and Exports.*

[In thousands of £'s.]

Years (ended 30th June).	General Merchandise.			Bullion and Specie.	Total.	Excess of	
	Domestic.	Foreign.	Total.			Imports.	Exports.
	£	£	£	£	£	£	£
1860............	65,883,	3,612,	69,495,	10,688,	80,183,	—	4,729,
'61............	42,687,	3,053,	45,740,	5,867,	51,607,	15,397,	—
'62............	37,426,	2,296,	39,722,	7,676,	47,398,	—	4,529,
'63......	38,751,	3,842,	42,593,	13,365,	55,958,	—	3,266,
'64............	29,896,	3,195,	33,091,	21,957,	55,048,	13,610,	—
'65............	28,524,	6,065,	34,589,	14,134,	48,723,	3,059,	—
'66............	27,599,	6,170,	33,769,	17,925,	51,694,	41,121,	—
'67............	57,842,	3,066,	60,908,	12,681,	73,589,	13,460,	—
'68............	56,123,	2,617,	58,740,	19,538,	78,278,	—	853,
'69............	57,326,	2,281,	59,607,	11,904,	71,511,	19,596,	—
1870............	78,462,	3,368,	81,830,	12,150,	93,980,	2,349,	—
'71............	89,250,	9,004,	98,254,	20,509,	118,763,	—	5,952,
'72............	89,268,	3,269,	92,537,	16,641,	109,178,	24,226,	—
'73............	105,215,	3,635,	108,850,	17,627,	126,477,	11,776,	—
'74............	118,632,	3,510,	122,142,	13,881,	136,023,	—	11,886,
'75............	104,017,	2,950,	106,967,	19,194,	126,161,	—	10,764,
'76............	109,496,	3,084,	112,580,	11,774,	124,354,	—	25,046,
'77............	122,848,	2,667,	125,515,	11,684,	137,199,	—	34,679,
'78............	141,814,	2,949,	144,763,	7,045,	151,808,	—	54,543,
'79............	145,488,	2,520,	148,008,	5,208,	153,216,	—	56,118,
1880............	171,655,	2,436,	174,091,	3,571,	177,662,	—	19,123,
'81............	184,151,	3,844,	187,995,	4,043,	192,038,	—	35,113,
'82............	152,758,	3,605,	156,363,	10,295,	166,658,	—	6,843,
'83............	167,546,	4,087,	171,633,	6,629,	178,262,	—	21,664,
'84............	151,034,	3,240,	154,274,	13,986,	168,260,	—	21,359,
'85............	151,392,	3,231,	154,623,	8,798,	163,421,	—	34,094,
'86............	138,743,	2,825,	141,568,	15,096,	156,664,	—	16,242,
'87............	146,463,	2,741,	149,204,	7,500,	156,704,	—	1,935,
'38............	142,471,	2,520,	144,991,	9,670,	154,661,	8,525,	—
'89............	152,142,	2,525,	154,667,	20,134,	174,801,	—	13,531,
1890............	176,103,	2,611,	178,714,	10,864,	189,578,	—	18,060,
'91............	181,723,	2,544,	184,267,	22,699,	206,966,	—	23,388,
'92............	211,611,	3,030,	214,641,	17,293,	231,934,	—	45,048,
'93............	173,131,	3,466,	176,597,	31,129,	207,726,	—	17,983,
'94............	181,084,	4,779,	185,863,	26,547,	212,410,	—	58,091,
'95............	165,290,	2,947,	168,237,	23,701,	191,938,	—	27,653,
'96............	179,833,	4,043,	183,876,	36,032,	219,908,	—	44,485,
'97............	215,002,	3,955,	218,957,	21,314,	240,271,	—	56,880,
'98............	252,144,	4,383,	256,527,	14,690,	271,217,	—	111,359,

TABLE C.—*Statement of the Imports and Exports of France, including Bullion and Specie, in each of the Years from* 1860 *to* 1897.

[In thousands of £'s.]

Years.	General Imports.			General Exports.			Excess of	
	Merchandise.	Bullion and Specie.	Total.	Merchandise.	Bullion and Specie.	Total.	Imports.	Exports.
	£	£	£	£	£	£	£	£
1860....	106,292,	24,172,	130,464,	125,900,	17,900,	143,800,	—	13,336,
'61....	123,416,	16,904,	140,320,	106,408,	20,128,	126,536,	13,784,	—
'62....	115,968,	23,040,	139,008,	121,996,	19,784,	141,780,	—	2,772,
'63....	129,456,	23,912,	153,368,	141,056,	26,144,	167,200,	—	13,832,
'64....	136,296,	32,592,	168,888,	156,848,	29,288,	186,136,	—	17,248,
'65....	141,096,	27,172,	168,268,	163,460,	20,256,	183,716,	—	15,448,
'66....	153,804,	43,840,	197,644,	171,240,	24,880,	196,120,	1,524,	—
'67....	161,232,	34,556,	195,788,	157,368,	11,268,	168,636,	27,152,	—
'68....	170,328,	28,596,	198,924,	148,836,	15,748,	164,584,	34,340,	—
'69....	160,348,	28,616,	188,964,	159,744,	14,396,	174,140,	14,824,	—
1870....	139,912,	17,955,	157,867,	138,232,	12,097,	150,329,	7,538,	—
'71....	158,138,	12,700,	170,838,	131,119,	20,262,	151,381,	19,457,	—
'72....	180,064,	15,813,	195,877,	190,264,	13,829,	204,093,	—	8,216,
'73....	183,056,	25,276,	208,332,	192,892,	22,368,	215,260,	—	6,928,
'74....	176,900,	39,941,	216,841,	188,084,	8,257,	196,341,	20,500,	—
'75...	178,472,	37,742,	216,214,	192,280,	11,416,	203,696,	12,518,	—
'76....	196,352,	35,416,	231,768,	181,900,	9,345,	191,245,	40,523,	—
'77....	182,796,	29,918,	212,714,	174,832,	8,307,	183,139,	29,575,	—
'78....	203,556,	23,958,	227,514,	164,472,	9,788,	174,260,	53,254,	—
'79....	223,172,	17,254,	240,426,	170,784,	21,260,	192,044,	48,382,	—
1880....	244,520,	15,214,	259,734,	184,492,	22,169,	206,661,	53,073,	—
'81....	239,848,	16,556,	256,404,	188,958,	14,097,	203,055,	53,349,	—
'82....	238,476,	19,054,	257,530,	190,560,	16,600,	207,160,	50,370,	—
'83....	235,468,	9,308,	244,776,	182,468,	12,735,	195,203,	49,573,	—
'84....	209,560,	12,471,	222,031,	168,736,	8,458,	177,194,	44,837,	—
'85....	197,200,	22,139,	219,339,	158,232,	6,516,	164,748,	54,591,	—
'86....	204,664,	21,459,	226,123,	169,836,	16,887,	186,723,	39,400,	—
'87....	197,708,	13,408,	211,116,	169,528,	18,420,	187,948,	23,168,	—
'88....	207,488,	12,361,	219,849,	171,928,	13,798,	185,726,	34,123,	—
'89....	212,812,	21,723,	234,535,	192,140,	13,102,	205,242,	29,293,	—
1890 ...	218,096,	12,804,	230,900,	193,608,	16,909,	210,517,	20,383,	—
'91....	237,532,	27,283,	264,815,	189,220,	21,046,	210,266,	54,549,	—
'92....	205,436,	22,536,	227,972,	182,052,	10,802,	192,854,	35,118,	—
'93....	198,060,	21,915,	219,975,	173,056,	13,054,	186,110,	33,865,	—
'94....	191,796,	23,861,	215,657,	164,984,	10,288,	175,272,	40,385,	—
'95....	196,784,	17,446,	214,230,	183,572,	14,634,	198,206,	16,024,	—
'96....	197,152,	20,433,	217,585,	183,744,	21,805,	205,549,	12,036,	—
'97....	205,500,	19,534,	225,034,	192,124,	14,126,	206,250,	18,784,	—

TABLE D.—*Statement of the Imports and Exports of Germany, including Bullion and Specie, in each of the Years* 1880 *to* 1897.

[In thousands of £'s.]

Years.	General Imports.			General Exports.			Excess of	
	Merchandise.	†Bullion and Specie.	Total.	Merchandise.	†Bullion and Specie.	Total.	Imports.	Exports.
	£	£	£	£	£	£	£	£
1880....	218,355,	2,930,	221,285,	218,070,	3,510,	221,580,	—	—
'81....	227,995,	2,230,	230,225,	227,165,	4,025,	231,190,	—	—
'82....	243,000,	2,595,	245,595,	244,465,	3,520,	247,985,	—	—
'83....	252,570,	1,745,	254,315,	250,960,	3,525,	254,485,	—	—
'84....	242,170,	1,350,	243,520,	239,695,	3,365,	243,060,	—	—
'85....	216,230,	2,470,	218,700,	213,160,	2,940,	216,100,	—	—
'86....	215,460,	2,835,	218,295,	219,280,	3,295,	222,575,	—	4,280,
'87....	230,100,	3,350,	233,450,	231,235,	2,885,	234,120,	—	670,
'88...	244,290,	10,420,	254,710,	232,655,	10,500,	243,155,	11,555,	—
'89....	278,220,	5,365,	283,585,	234,325,	6,255,	240,580,	43,005,	—
1890....	286,235,	6,000,	292,235,	242,400,	4,535,	246,935,	45,300,	—
'91....	*228,540,	*13,265,	241,805,	*176,980,	*8,210,	185,190,	56,615,	—
'92....	*212,975,	*10,425,	223,400,	*164,050,	*9,800,	173,850,	49,550,	—
'93....	*215,545,	*8,615,	224,160,	*170,075,	*7,630,	177,705,	46,455,	—
94....	*210,250,	*17,000,	227,250,	*162,995,	*4,500,	167,495,	59,755,	—
'95....	*221,650,	*6,645,	228,295,	*183,115,	*5,310,	188,425,	39,870,	—
'96...	*231,895,	*13,055,	244,950,	*195,660,	*11,950,	207,610,	37,340,	—
'97....	*249,575,	*9,195,	258,770,	*197,785,	*7,565,	205,350,	53,420,	—

* Exclusive of through transit trade, the value of which has not been computed since 1890.

† Prior to 1891 the particulars given under this head include gold and silver bullion and specie only, whilst in 1891 and subsequent years the figures relate to precious metals of all kinds (*Edelmetalle*), thus including, in addition, broken gold and silver, &c., and other precious metals, the particulars of which were treated as merchandise in previous years.

TABLE E.—*Coal Shipped for use of Steamers in the Foreign Trade at Ports in the United Kingdom.*

[In thousands of tons.]

Year.	Tons.	Year.	Tons.
1880...........................	4,926,	1890......................	8,096,
'81............................	5,228,	'91......................	8,536,
'82............................	5,575,	'92........	8,600,
'83............................	6,401,	'93......................	8,126,
'84........	6,615,	'94......................	9,294,
'85............................	6,681,	'95......................	9,408,
'86................	6,698,	'96......................	9,937,
'87............................	6,869,	'97........	10,456,
'88............................	7,121,	'98........	11,264,
'89............................	7,737,		

F.—*The Earnings and Value of the Mercantile Fleet since* 1882.

It would have encumbered the paper too much to include in it an account of the various statements which I have collected or had prepared as to the earnings and value of our shipping fleet since the period of the former paper, viz., 1880-82. As stated in the text, very great changes have taken place, and it cannot be assumed from the increase of the shipping fleet itself, and particularly the increase of the steam shipping fleet, that the value and earnings have increased in proportion, although there is a very considerable increase.

In the paper of 1882 accounts were given respecting a certain number of our leading shipping companies. I do not know whether it would be possible to give similar particulars for all of them at the present time, but one or two comparisons may suffice to show the change that has taken place. The Peninsular and Oriental Company is one of the most important and typical of one description of steamship. The tonnage of the fleet of this company in 1880 was given in the paper referred to as over 127,000 tons. This is gross registered tonnage, and the value of the fleet being

stated in the accounts as 2,213,000*l.*, the value per ton works out at 17*l.* 8*s.* In the last accounts of the company the corresponding figures would be : tonnage 261,000 tons, total value 2,948,000*l.*, which gives a value per ton of rather more than 11*l.* These figures appear to be rather lower than the real value, which was stated, I believe by the chairman, at the last annual meeting, as about 13*l.* 10*s.* per ton, but there is no doubt of a considerable reduction from the average value per ton as stated in 1882. Similarly, the Cunard Steamship Company which had a fleet of 61,000 tons in 1880, valued at 18*l.* 12*s.* per ton, has now a fleet of 119,000 tons, valued at about 13*l.* 10*s.* per ton. Some such changes have no doubt occurred with reference to the valuations of the higher class of steamers. These are the figures per gross registered ton. The equivalent per net registered ton, as explained in the paper of 1882, would be about 50 per cent. more.

In the paper of 1882 the average value of the highest class of vessels, including however some of a second class, was put at 16*l.* 13*s.* per ton gross, or 25*l.* per net registered ton, and the average reduction now, according to the above and other figures, would appear to be 20 to 25 per cent.

It is more interesting still to compare the average value of what are called " ordinary cargo " steamers, and on this head, through the courtesy of leading firms of ship brokers, I am enabled to give the following table of prices of cargo steamers continuously from the year 1882, separate figures being shown for new steamers, for second hand steamers, two to five years old, and for second hand steamers, five to ten years old. These figures, it will be observed, are given, not for the gross registered ton, as is the case with those already referred to, but for what is called per ton dead weight, an expression well known in the shipping trade. For the purpose of this paper it would have been more convenient to have the figures stated per gross registered ton or per net registered ton, as it is with these figures that we have to deal in the official statistics. But the dead weight ton being adhered to all through in the tables, the figures are of course satisfactory so far for comparison, except to the extent that the shipbuilding has improved, so that the carrying capacity of ships has been increasing in proportion to the same number of gross registered or net registered tons. The following is the table :—

Value of Cargo Steamers, 1882-98.

[Per ton dead weight.]

	New Steamers.		Second hand.			
			2—5 Years Old.		5—10 Years Old.	
	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
1882	13 –	—	10 – to 11 –		8 –	—
'83	9 –	—	9 – ,, 10 –		6 – to 7 –	
'84	8 –	—	8 – ,, 9 –		5 – ,, 6 –	
'85	7 10	—	6 –	—	5 –	—
'86	(Sales were nominal, on account of the depression.)					
'87	7 10	—	6 –	—	5 –	—
'88	8 –	—	6 –	—	5 –	—
	At the end of 1888 there was a rapid advance in prices, equal to 2*l.* to 3*l.* per ton dead weight.					
1889	9 –	—	9 –	—	7 –	—
'90	9 –	—	7 – to 8 –		5 – to 6 –	
'91	7 –	—	5 10	—	4 10	
	Prices eased very much towards the end of this year.					
1892	7 –	—	5 –	—	4 –	—
'93	6 –	—	4 10	—,	3 10	—
'94	6 –	—	4 10	—	3 – to 3 10	
'95	6 –	—	4 – to 4 10		3 –	—
'96	5 10 to 6 –		4 –	—	3 –	—
'97 { first half	6 – ,, 6 10		5 –	—	3 10 to 4 –	
'97 { second half	Little contracted, owing to engineers' strike		6 –	—	4 10 ,, 5 –	
'98 { first half	6 10 to 7 –		6 –	—	5 –	—
'98 { second half	7 10	—	6 10	—	5 – to 5 10	

The effect of this table is that whereas in 1882 new steamers cost 13*l.* per ton dead weight, and in the following year were still as high as 9*l.* per ton; the price in 1896 was as low as 5*l.* 10*s.* to 6*l.* per ton, and although there has been improvement since, the figure for 1898 is as low as 7*l.* 10*s.* per ton. There are corresponding changes it will be observed in second hand steamers, the reduction in value, broadly speaking, being about 40 per cent. The reduction per gross registered ton, or per net registered ton, would not apparently be so great, as the carrying capacity in proportion to such tonnage has increased; but allowing for every improvement that may have taken place in the carrying capacity of ships per gross registered ton or per net registered ton, we have here undoubtedly a great reduction of the value of the shipping fleet as reckoned by such tonnage.

With regard to earnings, it would appear from the accounts of the P. & O. Company already referred to, that whereas in 1882 the earnings of a fleet of 127,000 tons amounted to 2,014,000*l.*, or 15*l.* 17*s.* per ton, the earnings in 1898 of a fleet of 260,000 tons amounted to 2,844,000*l.*, or about 11*l.* per ton. At this distance

of time it may be possible that some changes in making the computation have inadvertently been made. But apparently there is some such reduction in the gross earnings per ton as from close upon 16*l.* to 11*l.* Similarly, in the Cunard Company, the gross earnings per ton in 1880 worked out as 18*l.* 11*s.*, but in the last accounts of the company the figure would appear to be at the present time about 11*l.* per ton. Some of the leading companies which give figures on this head at the former period do not appear to give them now, but a figure of 11*l.* per gross ton would appear to be for such steamers a fair average; and the reduction is thus from about 15*l.* per ton to 11*l.* per ton, or over 25 per cent., the equivalent change in the net registered ton being from 20*l.* to 15*l.*

A corresponding change in the earnings of cargo steamers, which were reckoned in 1882 as earning about 15*l.* per net registered ton as a minimum, would be a reduction to 11*l.* per ton.

That some such reductions have in fact occurred appears to be confirmed by the following statements from leading ship owners and other persons connected with the shipping trade, which may be enumerated as Statements A and B.

Statement A is to the following effect.

" In the past sixteen years there has been an average reduction " in freights of about 30 per cent., and the reduction in gross " earnings per ton would probably amount to 20 per cent. With " regard to insurance I should say that there has been a reduction " in this charge of from 20 to 25 per cent."

Statement B is to the following effect.

" In 1882 we built steamers for ordinary cargo purposes " carrying about 3,000 tons, and the cost was about 9*l.* 10*s.* per " ton on the carrying capacity. By 1897 for the same trades and " purposes we built steamers of 4,500 tons at a cost of 6*l.* 5*s.*, " from which you will see that the increase in size was 50 per cent., " decrease in cost, 33 per cent. To propel the larger boats at the " same speed, increased consumption of coal, 20 per cent.

" There is no such thing as the average freight or the average " earning, speaking of the ships under our charge. You may " deduce the average earning of a given company, but probably " the vessels earning would not be the same in 1897 as in 1882, " and the comparison consequently would not be the same thing. " Also a shipper of one article between two places, say coal from " Cardiff to Port Saïd, our modern trade, could tell you his average " rate per ton for any year, but the average of two competitors in " the same trade would not agree.

" I do not think wages have changed much, if anything.
" Probably a little dearer; crews, provisions, &c., hardly any
" change. Insurance cheaper, but not to an extent to make any
" serious difference in working expenses."

The correspondent who supplies Statement B also adds some
rates of freight in 1882 and 1897, for the purpose of showing how
violently freight rates fluctuate.

Freights in 1882 and 1897 compared.

	1882.		1897.	
	s.	*d.*	*s.*	*d.*
Cardiff to Genoa	11	6	5	3
Cardiff to Bombay .... {	24	6	} 15	–
	15	9		
Bombay U/H................... {	33	9	13	6
	38	9	35	–
			6	9
Cardiff to Port Saïd	14	6	{ 7	6
			10	3

These figures fully confirm the statement as to freights quoted
in the text, and the correspondent adds, that at the lower freights,
the larger ships having less coal and costing so much less, have
done well. He adds a note which it may be useful to quote as
bearing on the general subject of freight earnings and of this
paper :—

" Invisible exports and imports. What are the Suez Canal
" dues in this view? They are paid in Egypt; the shareholders
" are all over Europe. The P. & O. Company pay about 250,000*l.*
" per annum in canal dues. Every steamer of 5,000 tons capacity
" for the voyage to and from India, pays in dues at Port Saïd
" about 2,500*l.*, a large proportion of the freight."

A further statement received does not make comparison
between the present time and 1882, going back to 1890 only, but
as far as it goes it will be observed, what the correspondent states
is fully in agreement with the tables as to the value of ships above
given :—

" I calculate that the builders' prices to-day, for good size
" tramp steamers are just about equal to what they were in 1890.
" The drop in prices between 1890 and 1895, was in my opinion
" about 25 per cent. The lowest prices that were accepted was in
" 1894-95 and 1896, in which three years prices were about the
" same. The increase in prices between 1896 and 1897 was about
" 10 per cent., and between 1897 and the end of 1898 about 15

" per cent., making a total increase of about 25 per cent. from
" the lowest point during the last nine years."

To show further the course of our shipping trade in recent
years, the following extracts are made from the circulars of
Messrs. Angier Brothers, and of Mr. John White at different
dates between 1890 and 1895.

Extract from Messrs. Angier Bros.' Circular, dated
31st December, 1890.

" The loss of earning power has reduced the market value of
" steamers, and few buyers who know much of the working of
" them would be tempted to pay above 6*l*. 10*s*. to 7*l*. for good new
" boats with triple expansion engines of the best type and fair
" 9 to 10 knots speed. Builders' costs on the other hand have not
" yet come down sufficiently to allow them to tender at these
" prices, but all things taken into account, they run little risk by
" taking distant deliveries on about these terms."

Extract from John White's Annual Shipping Review, dated
1st January, 1891.

" Prices of ready and second hand steamers have, in sympathy
" with the cost of new vessels, considerably declined, and for all
" vessels there is a fall of fully 20 per cent. on the year. Steel
" sailing ships can be contracted to be built at 10 per cent. less
" than iron vessels ten years old realised twelve months since."

Extract from John White's Annual Shipping Review,
dated 2nd January, 1893.

" The reduced demand for new vessels has enabled builders
" and engineers, also manufacturers of material, to obtain a
" reduction of wages from the inflated rates the men obtained in
" busy times, and builders are now able to quote unprecedentedly
" low prices. Contracts can now be placed at 10 to 15 per cent.
" less than twelve months ago, when there had already been a
" substantial reduction."

Extract from John White's Half-Yearly Shipping Review,
dated 10th July, 1893.

" The prices at which contracts have lately been placed are
" unprecedented, but having been taken by responsible firms who

" are not likely to accept less than cost, proves the economies that
" have been made in shipbuilding, to enable steamers to be
" produced at such figures. The prices accepted for steamers of
" 5,000 tons have not exceeded what would have been the cost of
" a vessel half the size ten years since, or what would have been
" paid four years since for a vessel of 3,000 tons."

Extracts from John White's Annual Shipping Review, dated 1st January, 1895.

" Material is at the lowest price known, being 4*l.* 12*s.* 6*d.* for
" steel plates, against 5*l.* 10*s.* in March." . . . . . . " Second hand
" steamers, with compound engines, have depreciated most severely
" during the past year, owing to the reduced price of new tonnage,
" and to timidity of purchasers to run vessels except of the most
" modern type. A large number of steamers of ten to thirteen
" years old, but with boilers good for several years' work, have
" changed hands at prices 25 to 30 per cent. less than they would
" have realised twelve months previously. The Japanese have
" been large customers for second hand modern and old steamers,
" and for such boats have paid fairly good prices."

" The production of sailing vessels has been very small during
" the past year. New vessels built on speculation have realised
" extremely low prices, and the most recent sales of second hand
" ships show a very marked reduction ; indeed, it is most difficult
" to effect sales of this class of property."

Extract from John White's Annual Shipping Review, dated 2nd January, 1899.

" Prices of new steamers are about 15 per cent. higher than at
" the commencement of the year. Very large profits have been made
" by sellers on steamers in a forward condition that could take
" advantage of the good freights. Second hand steamers have
" met with a ready sale, and commanded prices fully 10 per cent.
" over what they would have realised twelve months since. Many
" owners have taken advantage of the good prices to realise their
" old tonnage with a view to replacing with modern boats later
" on."

From all these statements it is evident that the great develop-
ment of our shipping trade in the last sixteen years has been
accompanied by an equally remarkable reduction in the cost of
constructing the ships, especially when measured by their carrying

capacity, and by an equally remarkable reduction of the cost of working per ton. It would clearly therefore be impossible to assume the same rate of gross earnings as was assumed in 1882. The average of course changes greatly from year to year, but a reduction of gross earnings from 15*l.* per net registered ton, which was the average assumed in 1882, to 11*l.* or 12*l.* per net registered ton at the present time would appear to be justified.

As further bearing on the subject, it may be noticed that there has been no such increase in the number of persons employed in the shipping fleet or in the rates of pay as would have implied any great increase in the cost of working. It appears from the Table No. 26 of the Annual Return as to the progress of British Merchant Shipping published by the Board of Trade, that in 1882 the total number of persons, exclusive of masters and also exclusive of Lascars, was 196,000. Inclusive of masters, the number would probably have been somewhere about 210,000. At the present time, that is in 1897, inclusive of masters, the numbers are given as 209,000, so that in the interval it would seem there has been no great increase, although there has been a considerable increase from a year like 1886 or 1887, when, as we have seen, shipping was extremely distressed. There appears, however, to have been a considerable increase in the number of Lascars, who must have amounted in 1888 to about 18,000 and in 1897 to 31,000, these being the differences between the total numbers employed altogether and the total employed exclusive of Lascars. Altogether then in spite of the enormous increase of our mercantile fleet in the last sixteen years, there has been no great increase in the European *personnel*, and unless there has been an increase of wages, this part of the cost of production can hardly have increased.

It will be seen from some of the statements above given, that the rates of wages are not considered to have increased, and this appears to be fully confirmed by an examination of the returns respecting wages, which have been published by the Board of Trade. There has been no such increase of rates of wages as to add to the cost of working the mercantile fleet per ton, and apparently the cost per ton has rather diminished than increased when we compare 1897 with 1882. At the same time it must be remembered that as the change which has been going on in recent years consists in an exclusive increase of steamers along with a diminution of sailing ships, and as the rates of wages are higher in steamers than in sailing ships, the effect is that there must be some increase in the total payment of wages as compared with the period sixteen years ago. The rates for each class may remain pretty much the same, but it is the classes at the higher

rates which have increased in the interval. The aggregate is accordingly increased to a certain extent without much change in the rates of wages for each class. This result is quite consistent with there being no increase in the cost of wages per ton as already stated, but rather a decrease. The increased number of tons, as we have seen, has not brought with it any corresponding increase in the numbers employed.

The following statement as to wages, compiled from the Board of Trade returns, appears to confirm these unofficial statements.

Statement showing the Monthly Rates of Wages (in addition to Food) of A.B.'s on SAILING AND STEAM VESSELS *for certain Voyages from the undermentioned Ports of the United Kingdom in* 1882 *and* 1897 *respectively.*

[Extracted from the tables showing the progress of British Merchant shipping for 1882 and 1897 respectively.]

Port and Voyage.	Monthly Rates of Wages of Able Seamen on			
	Steamships in		Sailing Vessels in	
	1882.	1897.	1882.	1897.
Glasgow.	s.	s.	s.	s.
Mediterranean	70 to 75	70	60 to 65	—
North America...................	70 ,, 80	80	75 ,, 80	60
South ,, ...	65	70	60	55
East Indies and China ...	70	65	60	55
Australia	70	70	60	55
Liverpool.				
Mediterranean	65 to 70	70	60	60
North America...................	80 ,, 90	80 to 90	60	55 to 60
South ,, ...	60	70	55	55
East Indies and China ...	60	70 to 75	55	55
London.				
Mediterranean	70 to 80	70 to 75	60 to 65	65
North America	75 ,, 80	80	60 ,, 65	55
South ,, ...	60 ,, 70	70	60	55
Coast of Africa	65 ,, 75	75	—	—
East Indies and China ...	60 ,, 75	70	60	55
Australia	65 ,, 70	70 to 80	60	55
Newcastle and Shields.				
Mediterranean	80	80 to 85	—	—
North America...................	80	80 ,, 85	—	—
South ,, ...	80	80 ,, 85	60 to 70	60
Coast of Africa	80	80 ,, 85	—	—
East Indies and China	80	80 ,, 85	60	60
Australia	80	80 ,, 85	—	—

These statements as to wages, then, fully support the view above given as to there being no noticeable increase in the rates

for each class of person employed. As already stated, however, this is quite consistent with an increase in the wages bill in the aggregate, although the European *personnel* has not increased because the classes at higher rates have increased and the others diminished, and also with a decrease in the outlay on wages per net registered ton, because the tonnage has increased so enormously.

It will have been seen also from the above statements that the outlay for coal per ton has greatly diminished, but the coal bill in the aggregate must have greatly increased. The increase in the coal consumed according to statement B amounts to 20 per cent. where there is an increase of 50 per cent. in tonnage; and as the steam tonnage since 1882 has increased altogether 150 per cent., this implies an addition of 60 per cent. to the coal bill of the former period.

Similar changes we may assume have taken place with regard to other items, such as repairs, depreciation, and insurance. The cost per ton has diminished, but the aggregate increased.

Altogether the consideration of the outlays for the shipping fleet supports the statements as to the reduction in gross earnings. The fleet has increased enormously, but the cost of working has greatly diminished, rendering possible the reduction of freights.

In the time at my disposal it was not possible to obtain the elaborate statements as to cost of working supplied in 1882, but it may be hoped that the renewed interest in the subject will induce some further inquiries on this head.

TABLE G.—*Imports and Exports of Merchandise into and from the United Kingdom in 1897, showing the Excess of Imports in Trade with the following Groups of Countries.*

[In thousands of £'s.]

	Imports.	Exports.	Excess of Imports.	Excess of Exports.
Group 1. *Northern European Countries.*	£	£	£	£
Russia { Northern ports	15,229,	10,172,	5,057,	—
Russia { Southern ,, ...	7,054,	1,696,	5,358,	—
Sweden and Norway..............................	14,834,	7,547,	7,287,	—
Denmark and Iceland	10,968,	3,476,	7,492,	—
Germany	26,189,	32,012,	—	5,823,
Holland	28,971,	13,260,	15,711,	—
Belgium	20,886,	12,788,	8,098,	—
	124,131,	80,951,	49,003,	5,823,
Deduct excess of exports...........	—	—	5,823,	—
Net excess of imports	—	—	43,180,	—
Group 2. *Southern European Countries.*				
France	53,347,	19,518,	33,829,	—
Portugal...	2,653,	1,907,	746,	—
Spain	13,126,	3,816,	9,310,	—
Italy	3,317,	6,312,	—	2,995,
Austrian territories	1,276,	2,120,	—	844,
Greece..	1,639,	922,	717,	—
Roumania	2,258,	1,441,	817,	—
Turkey	6,253,	6,968,	—	715,
	83,869,	43,004,	45,419,	4,554,
Deduct excess of exports...........	—	—	4,554,	—
Net excess of imports	—	—	40,865,	—
Group 3. *Foreign Possessions of European Countries.*				
Danish West Indies	20,	59,	—	39,
Holland—Java and other possessions } in Indian seas	322,	2,069,	—	1,747,
France { Algeria	671,	276,	395,	—
France { Senegambia	312,	429,	—	117,
France { West India islands	8,	143,	—	135,
Portugal—Azores and Madeira	151,	173,	—	22,
Spain { Canary Islands	575,	522,	53,	—
Spain { Fernando Po	1,	16,	—	15,
West India islands	43,	1,045,	—	1,002,
Philippine ,, ...	1,279,	424,	855,	—
	3,382,	5,156,	1,303,	3,077,
Deduct excess of imports...........	—	—	—	1,303,
Net excess of exports	—	—	—	1,774,

TABLE G *Contd.*—*Imports and Exports of Merchandise, United Kingdom.*

[In thousands of £'s.]

	Imports.	Exports.	Excess of Imports.	Excess of Exports.
Group 4. Asiatic Countries.	£	£	£	£
Persia	198,	443,	—	245,
Siam	247,	154,	93,	—
China, exclusive of Hong Kong and } Macao	2,685,	5,180,	—	2,495,
Japan	1,283,	5,978,	—	4,695,
	4,413,	11,755,	93,	7,435,
Deduct excess of imports	—	—	—	93,
Net excess of exports	—	—	—	7,342,
Group 5. United States	113,042,	37,934,	75,108,	—
Group 6. Other American Countries.				
Mexico	594,	1,732,	—	1,138,
Central America	1,013,	882,	131,	—
Hayti and San Domingo	74,	310,	—	236,
Republic of Colombia	556,	1,221,	—	665,
Venezuela	63,	569,	—	506,
Ecuador	92,	435,	—	343,
Brazil	3,736,	5,696,	—	1,960,
Uruguay	340,	839,	—	499,
Argentine Republic	5,754,	4,996,	758,	—
Chili	3,192,	2,376,	816,	—
Peru	1,454,	835,	619,	—
	16,868,	19,891,	2,324,	5,347,
Deduct excess of imports	—	—	—	2,324,
Net excess of exports	—	—	—	3,023,
Group 7. North Africa and other Countries.				
Egypt	9,294,	4,542,	4,752,	—
Tripoli and Tunis	327,	283,	44,	—
Morocco	212,	512,	—	300,
Western coast of Africa	240,	627,	—	387,
Other countries	1,227,	2,550,	—	1,323,
	11,300,	8,514,	4,796,	2,010,
Deduct excess of exports	—	—	2,010,	—
Net excess of imports	—	—	2,786,	—

Table G *Contd.*—*Imports and Exports of Merchandise, United Kingdom.*

[In thousands of £'s.]

	Imports.	Exports.	Excess of Imports.	Excess of Exports.
Group 8. *British Colonies and Possessions.*	£	£	£	£
Australasia	29,362,	23,696,	5,666,	—
British India	24,813,	28,009,	—	3,196,
Straits Settlements	3,643,	2,539,	1,104,	—
Ceylon	4,688,	1,071,	3,617,	—
Hong Kong	606,	2,080,	—	1,474,
Cape of Good Hope and Natal	4,948,	14,387,	—	9,439,
North American colonies	19,539,	6,465,	13,074,	—
West India islands, Guiana, and Honduras	2,204,	2,802,	—	598,
West African possessions	2,153,	1,998,	155,	—
Channel islands	1,327,	1,303,	24,	—
Gibraltar, Malta, Mauritius, and Aden	400,	2,010,	—	1,610,
Other possessions	332,	600,	—	268,
	94,015,	86,960,	23,640,	16,585,
Deduct excess of exports	—	—	16,585,	—
Net excess of imports	—	—	7,055,	—

Summary.

	Imports.	Exports.	Excess of Imports.	Excess of Exports.
	£	£	£	£
Group 1	124,131,	80,951,	49,003,	5,823,
,, 2	83,869,	43,004,	45,419,	4,554,
,, 3	3,382,	5,156,	1,303,	3,077,
,, 4	4,413,	11,755,	93,	7,435,
,, 5	113,042,	37,934,	75,108,	—
,, 6	16,868,	19,891,	2,324,	5,347,
,, 7	11,300,	8,514,	4,796,	2,010,
,, 8	94,015,	86,960,	23,640,	16,585,
Total	451,020,	294,165,	201,686,	44,831,
Deduct excess of exports	—	—	44,831,	—
Net excess of imports	—	—	156,855,	—

TABLE H.—*Imports and Exports of Merchandise into and from the United Kingdom in the Year* 1897 *in the Transhipment Trade.*

[In thousands of £'s.]

	Imports.	Exports.	Excess of Imports.	Excess of Exports.
	£	£	£	£
Russia	13,	114,	—	101,
Sweden	—	27,	—	27,
Denmark	3,	28,	—	25,
Germany	768,	974,	—	206,
Holland	842,	336,	506,	—
Belgium	551,	111,	440,	—
Channel Islands	6,	51,	—	45,
France	3,829,	122,	3,707,	—
Portugal, &c.	174,	10,	164,	—
Spain and Canaries	286,	21,	265,	—
Italy	60,	39,	21,	—
Austrian territories	12,	180,	—	168,
Greece	49,	—	49,	—
Turkish dominions	339,	34,	305,	—
Egypt	182,	21,	161,	—
Morocco and West Coast of Africa	—	132,	—	132,
British possessions in South Africa	—	532,	—	532,
,, India, including Ceylon and Straits Settlements	887,	1,072,	—	185,
Philippine Islands	91,	27,	64,	—
China, including Hong Kong	235,	121,	114,	—
Japan	31,	97,	—	66,
Australasia	—	978,	—	978,
British North America	—	410,	—	410,
,, West Indies and Guiana	—	86,	—	86,
Hayti and foreign West Indies	1,	108,	—	107,
United States	982,	4,163,	—	3,181,
Mexico	—	59,	—	59,
Central America	—	25,	—	25,
Republic of Colombia	315,	279,	36,	—
Ecuador	188,	—	188,	—
Chili	25,	68,	—	43,
Brazil	238,	158,	80,	—
Argentine Republic	—	69,	—	69,
Peru	—	16,	—	16,
Aden	312,	—	312,	—
Other countries	333,	284,	49,	—
	10,752,	10,752,	6,461,	6,461,

Note.—In some cases where no imports or exports are shown, it may be the case that the figures are included under other countries.

TABLE I.—*Imports and Exports of Gold and Silver Coin and Bullion into and from the United Kingdom in Trade with the undermentioned Countries in 1897, showing the Excess of Imports or Exports.*

[In thousands of £'s.]

	Imports.	Exports.	Excess of Imports.	Excess of Exports.
	£	£	£	£
Russia	—	6,917,	—	6,917,
Denmark	—	1,	—	1,
Germany	492,	12,703,	—	12,211,
Holland..	16,	867,	—	851,
Belgium	2,973,	2,015,	958,	—
France	3,640,	2,102,	1,538,	—
Portugal, &c.	477,	37,	440,	—
Spain and Canaries	90,	866,	—	776,
Austrian territories	—	4,205,	—	4,205,
Turkey	8,	11,	—	3,
Egypt	316,	1,082,	—	766,
West Coast of Africa	174,	137,	37,	—
China, including Hong Kong	693,	540,	153,	—
Japan	—	5,314,	—	5,314,
United States of America	10,156,	1,225,	8,931,	—
Mexico, Central and South America, (except Brazil) and West Indies .... }	3,384,	334,	3,050,	—
Brazil	394,	365,	29,	—
Gibraltar	11,	8,	3,	—
Malta	64,	66,	—	2,
British possessions in South Africa	13,654,	61,	13,593,	—
British East Indies.....................................	1,497,	9,156,	—	7,659,
Australasia	10,662,	116,	10,546,	—
British North America	2,	27,	—	25,
Other countries	138,	1,429,	—	1,291,
	48,841,	49,584,	39,278,	40,021,
Deduct excess of exports	—	—	—	39,278,
Net excess of imports........................	—	—	—	743,

TABLE K.—*Imports and Exports of Merchandise (Commerce Général) into and from France in 1897, in Trade with the undermentioned Countries, showing also the Excess of Imports or of Exports.*

[In thousands of £'s (25 frs. = £).]

Country.	Imports from.	Exports to.	Excess of Imports.	Excess of Exports.
	£	£	£	£
United Kingdom	26,308,	57,716,	—	31,408,
,, States	19,504,	13,544,	5,960,	—
Germany	14,884,	17,700,	—	2,816,
Belgium	14,072,	23,440,	—	9,368,
Switzerland	13,868,	13,348,	520,	—
Spain	13,008,	7,144,	5,864,	—
Russia	12,956,	1,632,	11,324,	—
Algeria	9,840,	9,412,	428,	—
Italy	8,664,	7,968,	696,	—
Argentina	8,536,	2,916,	5,620,	—
China	6,724,	1,180,	5,544,	—
Brazil	5,792,	3,508,	2,284,	—
Turkey	5,760,	3,044,	2,716,	—
British India	5,596,	788,	4,808,	—
Japan	3,764,	1,528,	2,236,	—
Australia	3,328,	1,008,	2,320,	—
Austria	2,860,	848,	2,012,	—
Sweden	2,640,	436,	2,204,	—
Chili	2,056,	756,	1,300,	—
Hayti	1,932,	268,	1,664,	—
Holland	1,772,	2,640,	—	868,
Egypt	1,652,	2,032,	—	380,
Roumania	1,516,	332,	1,184,	—
Tunis	1,172,	1,880,	—	708,
Uruguay	1,132,	504,	628,	—
St. Pierre and Miquelon	1,080,	300,	780,	—
Venezuela	1,044,	204,	840,	—
Norway	1,016,	320,	696,	—
Colombia	956,	1,136,	—	180,
French Indo-China	928,	1,540,	—	612,
Réunion	828,	780,	48,	—
Senegal, &c.	816,	1,272,	—	456,
Martinique	760,	520,	240,	—
British American colonies	756,	160,	596,	—
Mexico	704,	1,060,	—	356,
Greece	672,	580,	92,	—
Tripoli and Morocco	604,	464,	140,	—
Guadeloupe	524,	452,	72,	—
Spanish American colonies	512,	68,	444,	—
French Oceania	488,	440,	48,	—
Philippine Isles	448,	28,	420,	—
Portugal	436,	524,	—	88,
Africa, other countries	408,	252,	156,	—
Peru	388,	140,	248,	—
British African colonies	344,	388,	—	44,
Dutch East Indies	288,	120,	168,	—
Ecuador	252,	56,	196,	—
Asia, other countries	212,	68,	144,	—
Madagascar, &c.	188,	712,	—	524,
Guatemala	184,	44,	140,	—

TABLE K *Contd.*—*Imports and Exports of Merchandise (Commerce Général)*
into and from France in 1897.

[In thousands of £'s.]

Country.	Imports from.	Exports to.	Excess of Imports.	Excess of Exports.
	£	£	£	£
Denmark	156,	696,	—	540,
French Indian colonies	120,	40,	80,	—
West Coast of Africa	88,	60,	28,	—
French Guiana	64,	432,	—	368,
Oceania	60,	4,	56,	—
Malta, Cyprus, Gibraltar	40,	240,	—	200,
Siam	32,	12,	20,	—
Dutch Guiana	20,	8,	12,	—
St. Thomas	8,	448,	—	440,
Bolivia	—	4,	—	4,
Epaves, &c.	16,	—	16,	—
Zone franche	724,	1,336,	—	612,
Provisions de bord	—	1,644,	—	1,644,
Total	205,500,	192,124,	64,992,	51,616,
Deduct excess of exports	—	—	51,616,	—
Net excess of imports	—	—	13,376,	—

TABLE L.—*Statement of the* TRANSIT *Trade of France in* 1897, *showing
the Countries from which Goods were Received and to which Exported.*

[In thousands of £'s (25 frs. = £).]

Country.	Imports.	Exports.	Excess of Imports.	Excess of Exports.
	£	£	£	£
United Kingdom	1,296,	8,404,	—	7,108,
Switzerland	10,628,	4,572,	6,056,	—
United States	276,	2,944,	—	2,668,
Spain	2,228,	1,996,	232,	—
Italy	2,264,	1,160,	1,104,	—
Germany	2,172,	1,016,	1,156,	—
Brazil	128,	920,	—	792,
Belgium	2,152,	740,	1,412,	—
Argentina	—	648,	—	648,
Turkey	148,	160,	—	12,
Mexico	96,	124,	—	28,
Colombia	—	104,	—	104,
Egypt	192,	88,	104,	—
Chili	—	80,	—	80,
Peru	—	8,	—	8,
China	124,	—	124,	—
Holland	44,	—	44,	—
British India	24,	—	24,	—
Other countries	2,168,	976,	1,192,	—
	23,940,	23,940,	11,448,	11,448,

TABLE M.—*Imports and Exports of Gold and Silver (Commerce Général)
into and from France in 1897, in Trade with the undermentioned
Countries.*

IMPORTS.

[In thousands of £'s (25 frs. = £).]

Country Imported from.	Gold Bullion.	Gold Coin.	Silver Bullion.	Silver Coin.	Token Money.	Total Imports.
	£	£	£	£	£	£
United Kingdom	1,598,	104,	2,190,	312,	3,	4,207,
„ States	2,401,	1,012,	168,	16,	—	3,597,
Belgium	77,	2,305,	95,	1,111,	1,	3,589,
Switzerland	326,	66,	15,	1,397,	—	1,804,
Italy	403,	321,	39,	109,	3,	875,
Spain	126,	397,	268,	10,	—	801,
Colombia	511,	77,	43,	146,	—	777,
Mexico	—	—	22,	492,	—	514,
Egypt	—	462,	—	8,	—	470,
Turkey	—	424,	—	—	—	424,
Spanish American colonies	—	128,	7,	—	—	135,
Morocco	—	26,	—	90,	—	116,
Australia	—	116,	—	—	—	116,
Germany	—	77,	3,	33,	—	113,
Argentina	49,	—	6,	8,	—	63,
Chili	50,	—	10,	—	—	60,
Holland	46,	—	—	—	—	46,
Austria	—	—	—	15,	—	15,
Peru	—	—	4,	8,	—	12,
British African colonies	—	—	—	7,	—	7,
Brazil	—	—	3,	—	—	3,
Bolivia	—	—	2,	—	—	2,
French Guiana	367,	102,	—	—	—	469,
Tunis	—	—	4,	226,	—	230,
Senegal	—	—	2,	98,	—	100,
Madagascar	—	—	—	39,	—	39,
Martinique	—	—	4,	29,	—	33,
Guadeloupe	—	—	—	11,	—	11,
Other French colonies	87,	22,	1,	4,	—	114,
Zone franche	—	—	—	425,	—	425,
Other countries	167,	153,	2,	44,	1,	367,
Totals	6,208,	5,792,	2,888,	4,638,	8,	19,534,

TABLE M *Contd.*—*Imports and Exports of Gold and Silver of France.*

EXPORTS.

[In thousands of £'s (25 frs. = £).]

Country Exported to.	Gold Bullion.	Gold Coins.	Silver Bullion.	Silver Coins.	Token Money.	Total.
	£	£	£	£	£	£
United Kingdom	235,	379,	168,	600,	11,	1,393,
Germany........................	522,	1,699,	13,	—	—	2,234,
Switzerland	166,	—	143,	713,	—	1,022,
Italy	27,	—	5,	101,	28,	161,
British India	—	155,	—	—	—	155,
Other countries	86,	128,	6,	337,	24,	581,
Belgium	—	256,	15,	—	—	271,
Turkey	—	640,	13,	—	—	653,
Egypt	—	283,	17,	—	—	300,
United States................	—	813,	—	—	—	813,
Spain	—	—	22,	—	7	29,
Russia	—	—	—	3,572,	—	3,572,
Tunis	—	243,	9,	—	—	252,
Other French colonies	—	13,	1,	1,055,	26,	1,095,
Morocco	—	—	—	68,	—	68,
Algeria	—	—	—	563,	—	563,
British East Africa	—	—	—	66,	—	66,
French Indo-China	—	—	—	868,	—	868,
Greece...........................	—	—	—	—	27,	27,
	1,039,	4,609,	412,	7,943,	123,	14,123,

TABLE N.—*Imports and Exports of Domestic and Foreign Merchandise by Countries into and from the United States for Year ending* 30*th June,* 1898.

[In thousands of £'s ($5 = £).]

Countries.	Imports.	Exports.	Excess of Imports.	Excess of Exports.
Europe.	£	£	£	£
Austria-Hungary........................	943,	1,139,	—	196,
Azores and Madeira Islands	5,	76,	—	71,
Belgium	1,748,	9,521,	—	7,773,
Denmark	42,	2,540,	—	2,498,
France	10,546,	19,090,	—	8,544,
Germany	13,939,	31,008,	—	17,069,
Gibraltar	6,	61,	—	55,
Greece	182,	26,	156,	—
Greenland, Iceland, &c.	29,	—	29,	—
Italy	4,060,	4,654,	—	594,
Malta, Gozo, &c.	3,	13,	—	10,
Netherlands	2,507,	12,855,	—	10,348,
Portugal	521,	706,	—	185,
Roumania....	—	22,	—	22,
Russia, Baltic, &c.	530,	1,266,	—	736,
,, Black Sea	378,	201,	177,	—
Servia	2,	—	2,	—
Spain...	715,	2,046,	—	1,331,
Sweden and Norway	534,	1,263,	—	729,
Switzerland	2,276,	53,	2,223,	—
Turkey in Europe	424,	28,	396,	—
United Kingdom........................	21,828,	108,172,	—	86,344,
Total Europe	61,218,	194,740,	2,983,	136,505,
Deduct excess of imports ...	—	—	—	2,983,
Net excess of exports	—	—	—	133,522,
North America.				
Bermuda	93,	200,	—	107,
British Honduras	31,	111,	—	80,
Nova Scotia, New Bruns-⎫ wick, &c. ....⎰	853,	908,	—	55,
Quebec, Ontario, &c.	4,555,	14,993,	—	10,438,
British Columbia	921,	840,	81,	—
Newfoundland and Labrador....	75,	241,	—	166,
Costa Rica	519,	316,	203,	—
Guatemala	368,	241,	127,	—
Honduras	169,	140,	29,	—
Nicaragua.................................	219,	217,	2,	—
Salvador	178,	149,	29,	—
Mexico	3,800,	4,241,	—	441,
Miquelon, Langley, &c.	32,	41,	—	9,
British West Indies	2,133,	1,677,	456,	—
Danish ,, ...	66,	142,	—	76,
Dutch ,, ...	35,	109,	—	74,
French ,, ...	6,	324,	—	318,
Haiti...	226,	594,	—	368,

Note.—A discrepancy will be observed between the figures here shown and those appearing in Table B. This is due to the fact that in one table the dollar is reckoned at 4s. 2d., and in the other at 4s.

TABLE N *Contd.—Imports and Exports into and from the United States.*

[In thousands of £'s ($5 = £).]

Countries.	Imports.	Exports.	Excess of Imports.	Excess of Exports.
North America—Contd.	£	£	£	£
Santo Domingo	426,	230,	196,	—
Spanish-Cuba	3,046,	1,912,	1,134,	—
Puerto Rico	483,	301,	182,	—
Total North America	18,234,	27,927,	2,439,	12,132,
Deduct excess of imports	—	—	—	2,439,
Net excess of exports	—	—	—	9,693,
South America.				
Argentina	1,184,	1,286,	—	102,
Bolivia	—	4,	—	4,
Brazil	12,350,	2,664,	9,686,	—
Chile.......................................	747,	470,	277,	—
Columbia	1,037,	656,	381,	—
Ecuador	153,	171,	—	18,
Falkland Islands	—	—	—	—
British Guiana...........................	612,	358,	254,	—
Dutch ,, ...	291,	76,	215,	—
French ,, ...	3,	26,	—	23,
Paraguay	—	—	—	—
Peru	145,	261,	—	116,
Uruguay	354,	243,	111,	—
Venezuela.................................	1,543,	549,	994,	—
Total South America	18,419,	6,764,	11,918,	263,
Deduct excess of exports	—	—	263,	—
Net excess of imports........	—,	—	11,655,	—
Asia.				
Aden	404,	119,	285,	—
China	4,065,	1,998,	2,067,	—
British East Indies...................	5,448,	939,	4,509,	—
Dutch ,, ...	2,906,	240,	2,666,	—
French ,, ...	—	30,	—	30,
Portuguese ,, ...	—	—	—	—
Hong Kong	149,	1,253,	—	1,104,
Japan	5,045,	4,101,	944,	—
Korea	—	25,	—	25,
Russia, Asiatic..........................	22,	124,	—	102,
Turkey in Asia..........................	465,	49,	416,	—
All other Asia	15,	87,	—	72,
Total Asia	18,519,	8,965,	10,887,	1,333,
Deduct excess of exports	—	—	1,333,	—
Net excess of imports.......	—	—	9,554,	—

TABLE N *Contd.*—*Imports and Exports into and from the United States.*
[In thousands of £'s ($5 = £).]

Countries.	Imports.	Exports.	Excess of Imports.	Excess of Exports.
Oceanica.	£	£	£	£
Auckland, Fiji, &c.	—	1,	—	1,
British Australasia	1,116,	3,121,	—	2,005,
French Oceanica	37,	60,	—	23,
German ,,	—	2,	—	2,
Hawaiian Islands	3,437,	1,181,	2,256,	—
Spanish Oceanica	2,	1,	1,	—
Tonga, Samoa, &c.	14,	7,	7,	—
Philippine Islands	766,	25,	741,	—
Total Oceanica	5,372,	4,398,	3,005,	2,031,
Deduct excess of exports	—	—	2,031,	—
Net excess of imports	—	—	974,	—
Africa.				
British Africa	175,	2,406,	—	2,231,
Canary Islands	5,	55,	—	50,
French Africa	96,	134,	—	38,
German ,,	—	—	—	—
Liberia	1,	3,	—	2,
Madagascar	3,	45,	—	42,
Portuguese Africa	3,	580,	—	577,
Spanish ,,	—	6,	—	6,
Egypt	1,007,	137,	870,	—
Tripoli	12,	26,	—	14,
All other Africa	137,	80,	57,	—
Total Africa	1,439,	3,472,	927,	2,960,
Deduct excess of imports	—	—	—	927,
Net excess of exports	—	—	—	2,033,

Recapitulation.

Countries.	Imports.	Exports.	Excess of Imports.	Excess of Exports.
	£	£	£	£
Europe	61,218,	194,740,	—	133,522,
North America	18,234,	27,927,	—	9,693,
South ,,	18,419,	6,764,	11,655,	—
Asia	18,519,	8,965,	9,554,	—
Oceanica	5,372,	4,398,	974,	—
Africa	1,439,	3,472,	—	2,033,
Grand total	123,201,	246,266,	22,183,	145,248,
Deduct excess of imports	—	—	—	22,183,
Net excess of exports	—	—	—	123,065,

See note, p. 65.

TABLE O.—*Import and Export of Gold and Silver into and from the United States in the Year ending 30th June, 1898, in Trade with the undermentioned Countries, showing also the Excess of Imports or Exports.*

GOLD.

[In thousands of £'s ($5 = £).]

	Imports.	Exports.	Excess of Imports.	Excess of Exports.
	£	£	£	£
France	4,560,	803,	3,757,	—
Germany	1,686,	252,	1,434,	—
United Kingdom	8,627,	89,	8,538,	—
Other European countries	109,	—	109,	—
British Honduras	7,	—	7,	—
Quebec, Ontario, &c	942,	638,	304,	—
British Columbia	685,	19,	666,	—
Central America	103,	23,	80,	—
Mexico	1,024,	2,	1,022,	—
Haiti	—	69,	—	69,
San Domingo	—	36,	—	36,
British West Indies	25,	—	25,	—
Cuba	1,033,	840,	193,	—
Other West Indies	112,	8,	104,	—
,, North American countries	107,	42,	65,	—
Columbia	48,	5,	43,	—
Venezuela	124,	21,	103,	—
Other South American countries	4,	5,	—	1,
China	—	—	—	—
East Indies	—	—	—	—
Hong Kong	—	13,	—	13,
Japan	—	—	—	—
Hawaii	—	216,	—	216,
British Australasia	4,456,	—	4,456,	—
Other Asiatic countries	426,	—	426,	—
Africa	—	—	—	—
Other countries	—	—	—	—
	24,078,	3,081,	21,332,	335,
Deduct excess of exports	—	—	335,	—
Net excess of imports	—	—	20,997,	—

TABLE O *Contd.*—*Import and Export of Gold and Silver into and from the United States.*

SILVER.

[In thousands of £'s ($5 = £).]

	Imports.	Exports.	Excess of Imports.	Excess of Exports.
	£	£	£	£
France..............................	5,	212,	—	207,
Germany...........................	1,	—	1,	—
United Kingdom	5,	8,491,	—	8,486,
Other European countries	—	—	—	—
British Honduras	39,	—	39,	—
Quebec, Ontario, &c...................	14,	29,	—	15,
British Columbia	674,	5,	669,	—
Central America.........................	158,	75,	83,	—
Mexico	5,005,	240,	4,765,	—
Haiti	—	—	—	—
San Domingo.............................	—	68,	—	68,
British West Indies	4,	—	4,	—
Cuba	—	—	—	—
Other West Indies......................	131,	7,	124,	—
,, North American countries	2,	—	2,	—
Columbia	28,	5,	23,	—
Venezuela	—	—	—	—
Other South American countries	116,	13,	103,	—
China	—	195,	—	195,
East Indies.................................	—	288,	—	288,
Hong Kong.................................	—	1,365,	—	1,365,
Japan	—	12,	—	12,
Hawaii	—	15,	—	15,
British Australasia	—	—	—	—
Other Asiatic countries..............	3,	—	3,	—
Africa......................................	—	—	—	—
Other countries	—	1,	—	1,
Total	6,185,	11,021,	5,816,	10,652,
Deduct excess of imports ...	—	—	—	5,816,
Net excess of exports	—	—	—	4,836,

DISCUSSION *on* SIR ROBERT GIFFEN'S PAPER.

MR. JOSEPH SAMUEL agreed entirely with Sir Robert Giffen in the deductions he had come to as to the excess of imports, but he did not agree in the statement of quantity of imports as given by the Board of Trade statistics. The same mistake had recurred in them for years, and was likely to occur unless the mode of taking the statistics was altered. According to the Board of Trade returns the excess of imports from 1886 to 1898 amounts to 1,538 million £. Sir Robert Giffen and all statisticians knew that such surpluses against the country were impossible; they would show a reckless mode of trading which could not be carried on in any business or any country. Sir Robert Giffen had demonstrated, however, that these figures were not correct, as there was no allowance made for the carrying trade; and further said that the excess of imports was accounted for to some extent by the fact that we valued the imports at the place of arrival and the exports at the place of shipment. Again, the foreign indebtedness to this country was undoubtedly very great, and was yearly increasing; yet there was something more than these things. The Board of Trade figures must be erroneous. From an abstract made by Mr. T. J. Pittar, he found that from 1699 to 1853, a period of over one hundred and fifty years, there was an excess of exports; but in 1854 a change was made in the system adopted by the Board of Trade in showing these figures, and this system was still followed. The imports were not valued at the true cost to the importer, but included freight, insurance, and various other charges, which loaded the imports to the extent of from 15 to 20 per cent. Exactly the reverse process took place with regard to the exports, and thus it was that so great an apparent excess of imports was shown.

Mr. JOHN GLOVER said every Fellow of the Society must share with him the satisfaction with which he had listened to this admirable paper. Even in his paper in 1882 Sir Robert Giffen very nearly laid the ghost of the alarm about the excess of imports over exports, and now he completed the achievement. He observed too with great satisfaction how very careful the author had been not to make any forecast for the future. He was much struck with a quotation from Professor Marshall, who was quoted as describing people as being "saturated with imports." He wished professors would use sober language. Who was saturated with imports? With what imports was anybody saturated? No one was obliged to take imports he did not want or could not pay for. Imports of one year might fairly be compared with those of another; but when political arguments were founded on comparisons of the value of imports with those of exports, they were comparing different things and getting on dangerous ground. The question was not did the imports exceed the exports, but did they exceed what was wanted and could be paid for. Notwithstanding these enormous imports, our warehouses were not overburdened

with stocks. Trade now was a hand-to-mouth trade. We did not indulge in the luxury of large stocks as we were forced to do in times of very inferior communications, when the receipt of goods by certain dates could not be relied upon. The next thing to be remembered about imports was that they were nearly all grown, though some were manufactured. There was hardly an article of any description imported into this country the producing of which had not been paid for close to the place of its production. The bulk of the imports into this country were paid for before they were set afloat for this country; they did not come here on speculation so far as the producers were concerned, but because some dealer saw his way by buying in one country and selling in another to turn 20s. into 20s. 6d. Further, all these enormous imports were paid for without any financial distress. We had long periods of abnormally cheap money and excellent credit. It was most significant moreover that besides the large imports during twenty-one years out of the last thirty, the imports of bullion had exceeded the exports. That money only came because it was due to somebody here. These considerations ought to dispel all fears regarding imports, and we no longer ought to trouble about the questions as to whether the imports were ahead of the exports or not. They were much indebted to Sir Robert Giffen for the invention of the term "invisible export." They had come to know now that the Board of Trade returns were incomplete. No doubt they were true so far as they went, but the imports were overstated and the exports were understated. The services done by our flag between different foreign nations, which made no mark whatever on the returns, were increasing. He did not think that the figures which Sir Robert had put down to the invisible item of freight, large as they were, were at all exaggerated. This was as real an export and had as true an exchangeable value as material goods. The fact was that under our free trade policy we had been able to put all the various countries of the earth under tribute to supply our wants; and by our easy methods of payment through goods, through cash, through services, through interest, and through the business we carried on in those foreign countries, we were enabled to get these goods with the least possible inconvenience and the greatest possible advantage to the industrious people of this kingdom.

Mr. A. E. BATEMAN said he must first pay a tribute to the excellence of this paper, which was in continuation of one the author gave the Society sixteen or seventeen years ago. That paper was the first of the kind, and was therefore more taking in its methods. This was more a continuation, but it was very useful; and at the Board of Trade they took it as being very valuable in showing how many allowances had to be made by anyone who tried to draw a balance sheet from what were called the Board of Trade returns. Those returns had been criticised that evening; and it might be explained that down to 1854 the imports were "official values," based on the prices of two centuries ago; but from 1854 to 1870 actual prices were taken, and since 1870 the declara-

tions of merchants, based on actual transactions, were the basis, so
that the returns now gave a fair account of the value of the goods
as they came into the ports, and the value as they left them.
That method, he maintained, was a proper and scientific way of
showing the trade of the country. It was the method, too, of all
civilised countries, with one or two exceptions. One of these
exceptions was the United States, which took the imports at their
value as they left the port from which they came. That was done
by them partly on account of their system of customs taxation *ad
valorem.* The paper brought out very clearly that these accounts
must be taken for what they were worth, and for no more. It was
impossible to make up a balance sheet or say whether the country
was getting richer or poorer by taking the Board of Trade returns
alone. To get a good idea of the state of the country they must
not only take the imports and exports, but also, *inter alia,* the
state of the money market, bank clearances, employment of labour,
pauperism, and the traffic on railways and the stocks consumed by
the great manufacturing populations. Many of the factors in
such an inquiry were estimates which should not be undertaken
by a Government department. The department should however
furnish all possible materials for such inquiries. This paper had
been compiled on such good methods and with such care (and the
author had come to his old workshop in many instances for his
material), that he did not think there could be very much criticism
on the figures; but there was one point especially he should like
to mention. There seemed in some quarters an idea that people
exported for the good of the Board of Trade returns, in order that
they should show a large total; but the fact was, the man who
exported something did it because he saw an opportunity of
making a profit for himself by the transaction, and the same
with the importer. An export very often had no relation to an
import whatever. Another point which was well brought out was
that we should not take alarm at the decrease or stagnation in
exports. Our manufacture for home consumption was of very
great importance, and had been materially increasing. As regards
the iron and steel industry, for example, the large production of
material for the defence of the country was a very considerable
item. Thousands of workers had been employed in the service of
the State, and that, as most of them believed, would be for the
security of trade and for the general benefit of the country.

Mr. WILLIAM FOWLER remembered the early discussions on this
subject raised about twenty years ago; and there were several
papers in the *Economist* to which he had turned back lately.
The point which struck him most was that if the arguments which
he had heard were correct, the whole of our gold would have been
gone long ago, and we should have been a bankrupt country; but
he did not see any evidence of bankruptcy. On the contrary, he
never saw so much evidence as he did at that time of prosperity.
He had been talking not long ago to a banker who lived in an
almost purely agricultural district, and had done so for twenty
years. He told him that he was quite sure the condition of that

district, notwithstanding the great depression of agriculture, was vastly improved; the deposits in the banks had greatly increased; and building was going on to an astonishing degree. That did not look like ruin coming over the country. If it were true that the mere fact of imports exceeding exports led certainly to the consumption of our own capital, long ago we must have consumed everything we had, and been entirely bankrupt. The more one thought about it, the more absurd the idea was. The explanation was just what Sir Robert Giffen had made. People owed us a great deal of money, and they had to send it to us in some way. We did all we could to send our goods away, but the fact that people owed us so much more than we sent away was not a fact we ought to complain of; it was rather an evidence of the wealth of the country. People did not send us these imports unless they were bound to send them in discharge of interest due or in payment for goods sent by us to customers in various parts of the world; they came by a natural process. He was not quite satisfied with regard to the calculation as to the earnings of ships; perhaps these were a little exaggerated, but the figures came out so large that some allowance might be made and yet a satisfactory result remain. Our imports exceeded our exports because we were an extremely wealthy nation, and were therefore able to import. We could not help competition, and ought not to desire to get rid of it; it stimulated our energies and made us see that our work was good. He was not at all surprised that the exports had what might be called rather a stationary appearance. The Germans were very busy, and so were the French and the United States. Our most serious competitor at the present time was the United States. No one, however high their opinion of the United States had been from an economical point of view, could have foreseen such a position as it now occupied. It had usurped, he was told, the place of Great Britain as the dominant power in the iron and steel trades. It had enormous resources in iron ore and in coal, which could be got out at a very low cost. The only surprising thing to him was that, notwithstanding all the competition, we were able to do as well as we did. He was very glad that this paper had been written, for it was a thoroughly sound paper, the explanations given were true, and we need not go away and think that John Bull was going to the dogs. He had been told all his life that this process was going on, but John Bull was still vigorous and hopeful.

Mr. T. J. PITTAR said he also should like to bear his testimony to the great value of this paper. Imports and exports did not constitute the national balance sheet; they constituted only one item, and as they saw from the enormous figures which had been given, were probably not by any means the largest part of the turnover if everything were taken into account. There were such great items for freight and commission to be taken into account that really the Board of Trade returns, although it could not be said that they sank into insignificance, at any rate were a much less proportion of the whole than people supposed. It was well

therefore that this popular fallacy that the Board of Trade returns of themselves constituted a balance sheet had been exposed. The paper showed, too, that an excess of imports did not mean that the balance of trade was really against us. The excess of imports in the case of an old and prosperous nation was really a sign of prosperity rather than of decay. That excess in the case of the United Kingdom was enormously augmented by the freights we received. But he asked whether, as there were a good many foreign lines carrying British goods, there might not be a little set off to those freights of which the author had taken account. Again, there was no special mention of the coasting trade. Even after making allowance for the repeated voyages shown in the totals of entrances and clearances, there was a considerable total tonnage employed in that trade, and he was not quite clear whether allowance had been made for that in the author's estimates of the freights earned by British shipping. With regard to the stationariness of the exports, we could not, in view of the comparative size and future populations of the countries, hope to maintain the first place as against the United States (which was our chief competitor in production), especially as regards iron, steel, and coal; but it did not at all follow from that that we were decaying as a commercial nation. We might still be progressing satisfactorily, though not quite so quickly as some of our rivals. Though the author drew attention to the fact that the great trading nations of the world did most of their business with each other, it was not to be inferred that we ought to neglect new countries. On the contrary, the keener the competition the greater was the necessity for a trading nation to open up the waste places of the earth and exploit the fields of industry that remained; they constituted our chief means of recuperation. He instanced the trade with the east coast of Africa, which was one of our latest fields of development, from Cairo to the Cape, and found that whilst compared with eight or ten years ago we had lost in our exports to America some 7 or 8 million £, we had in the same time increased our exports to that coast line of Africa by a rather larger amount. These less populous countries would in course of time come to be our great markets. He thought if we looked after the new countries, the trading with the old countries would look after itself. Mr. Bateman had explained already the method of making the returns. It was to take the values of the goods as they arrived at the doors of the kingdom, and the value of the exports at the same point. That must be taken to be the correct method; it was the value of the goods as they left us and as they reached us. They obtained the correct value in the vast majority of cases; and he thought the returns might be accepted with great certainty. Since 1854 the greatest attention had been directed to seeing that the correct values were obtained. With regard to imports, they did not get the market value, which would include the importer's profit, but simply the value at the hour of importation; and the same way with the exports. They had at times to incur some odium by having to enforce the law in order to get the correct values.

Mr. STEPHEN BOURNE thought the necessity of having a correct balance sheet might still be insisted upon. Though he did not believe that because our imports exceeded our exports we were drawing on our capital, we did want to gauge the prosperity of the country, and be able to ascertain what was the exact difference between the two; likewise the differences between one year and another. It was quite right with regard to imports to deduct the amount of freight included in the value before attempting to strike a balance; but the speaker differed from Sir Robert Giffen in the estimate he had made in putting the whole amount of freight which the ships earned as part of the means we had of paying for our imports, because it must be recollected that all that freight which was earned in respect of imports was already included in its value, and a large portion of the receipts abroad was expended in the maintenance of our ships whilst there. The only available means from freight of paying for anything got from abroad was the net amount which the ships might earn in carrying goods to other countries, where—not in England—they got paid for their work, which might come back in the shape of goods; also the very considerable amount which was earned by our ships in trading between foreign countries, or between the colonies and foreign countries, which did not come into the account at all. Another point to be considered was, that if we took credit on the one side for the proceeds of our investments and the income derived from the works we carried on abroad, we must take into account that a large amount of these investments went out in the shape of exports. Therefore we could not claim the exports altogether as a means of paying for our imports unless we deducted the portion which did not bring back any money at all, but which was employed abroad in producing an income. So in making a correct balance sheet, it must be remembered that a large portion of these exports went out not to bring back goods, but in the construction of railways and establishing manufactories, &c., abroad. We sent out plant and material which was not available as a set off against the imports which we derived from these industries. He did not think that the income of the people at home and the produce of home manufactures fairly entered into the question of the external trade of the kingdom at all. One point which had only been lightly touched upon, but which was of great importance, was that in arriving at a correct estimate some consideration must be given to a due relation between quantity and value; for instance, it appeared we had imported to the value of $19\frac{1}{2}$ million £ more this year than we did last; but on analysing the accounts something less than $1\frac{1}{2}$ million £ out of that was due to increase of cost, and 18 million £ only was due to extra quantity; whereas in other years the reverse might be the case. When we came to the exports, though in total value there was a deficiency of nearly 1 million £, between 2 and 3 million £ were saved in the cost of raw material for the cotton industry which might properly be added. If the previous year's prices had prevailed, our exports would have been 2 or 3 million £ more. There could be no gain to the country on a higher price paid for its imports, or a lower

received for its exports, on the whole bearings of the subject. Anything like an accurate conclusion could only be arrived at by a process of minute and extended investigation into the concerns of every country with which we traded and every person entering into that trade. This would be utterly impossible. It might be taken for granted that the preponderance of imports over exports depended on our power to pay for them; but it was a very unsatisfactory feature that our exports tended to decrease, or at all events not to increase in proportion to the increased number of our workers and our increased power of production. We ought to seek to employ our labours in the colonies and the foreign countries with which we traded; but there were a great many social questions involved in that point which could not then be entered upon.

Mr. HENRY BIRCHENOUGH, as a visitor, would like to join the previous speakers in thanking the author for his admirable paper; the uncontroversial spirit in which the subject was treated was quite worthy the traditions of the Society. Undoubtedly the actual excess of imports was larger than the apparent excess; the actual amount due to us from year to year was larger than the amount we received. But for our continuing to lend and re-invest abroad, the excess of imports would no doubt be larger than it was. This was a very important point, because, owing to these lendings, whether in the form of increased exports or cancellation of other obligations, we had undoubtedly to explain a larger annual excess of imports than we should otherwise have to do. This was proved by the extraordinary fluctuations from year to year in the amount of those excesses. For instance, in the period from 1875 to 1883 the excess was exceedingly high; from 1884 to 1890 the excess was much reduced; in 1891 to 1898 it had again jumped up in a most remarkable manner. He called attention to another curious fact, namely, that lumping together the nine years 1881-90, the excess of imports was slightly less than in the previous nine years. It was perfectly obvious that during those first nine years we had continued to increase our investments abroad, and the excess of imports ought to be larger in the second nine years than in the first. That they were not so was due to further lendings and to other circumstances to which attention had been called; in any case we had to explain a very much larger excess of imports than the figures showed. He saw nothing alarming in that excess of imports, but at the same time it was a question of vital interest to elucidate the matter as far as possible. Perhaps through the combined labour of a group of individuals they ought to be able to get at a closer knowledge of the elements which went to make up those large excesses. Sir Robert Giffen had called attention to the novel and interesting point of the probable influence of the excess of imports on the growth of our export trade. Our export trade was stationary. It had just kept pace with the drop in values; whereas our main competitor, Germany, had not only been able to keep pace with the drop in values, but to increase her trade considerably. As a manufacturer and exporter he could

not share the somewhat light-hearted indifference with which Sir Robert Giffen looked forward to this contingency of a decrease in our export trade, because he regarded our export trade as being one of the most valuable stimulants to the manufacturing industry of the country. If the industries of the country were driven purely to the home demand, they would stagnate and deteriorate considerably. A most important point in the export trade was the fact that it encouraged enterprise, took us abroad, and brought out those qualities which made us a great empire-building people. The combination of manufacturing and money-lending was one of the things which made us a great commercial people. If from a decline in our manufactures we ceased to be able to provide loans partly in cash and partly in goods, he felt sure that our loan business would seriously decrease, and thus the invisible exports would tend to shrink with the visible ones.

The PRESIDENT (The Right Hon. LEONARD H. COURTNEY, M.P.) said his first duty was to tender on behalf of the Society their best thanks to their colleague, Sir Robert Giffen, for adding to the many favours he had already conferred on the Society by reading this paper. It was not only one of great elaboration and value, but it was a paper of great fascination. Sir Robert showed them an intercourse not merely of dual or triangular trade, but of multiangular trade, going on between all the countries of the world. He showed them, too, how certain circles of our trade were varying in their dimensions. Here he referred especially to that very great trade, the coal trade. The limit of space to which we could with profit send coal was becoming contracted; the circle of export was becoming diminished. The outer circumference was determined by what might be called the interference of two curves of cost: the point where the cost of getting coal from Great Britain was coincident with the point of cost of getting coal from another competitive country was the point to which we could both send. If we went beyond that, we should be at a disadvantage, but within it we were at an advantage. But the wave of expansion in that particular trade had clearly contracted, as was shown by the statistics of the export of commodities to different lands. This was another most remarkable phenomenon, which must be carefully watched if one wished to master the real current of trade with and between foreign countries. There was some danger in the extreme multiplicity and variety of details of a paper such as the present, and, to repeat an old saying, there was danger that they might occasionally fail to see the wood for the multitude of trees. Some simplicity of conception perhaps was wanted. They all knew of *rentier* families, families living on their means, having an income derived from investments, living upon them, and supporting a certain number of dependents, who contributed to the care of those families. There were some parts of this country which might be called *rentier* districts, where people lived on the savings they had made for the most part, or on incomes or pensions derived from services performed in other parts of the world. That conception from a

rentier family or district might be carried on, and such a thing as a *rentier* country might be conceived. Now, our foreign trade was due to some extent to the fact that we had lent large sums abroad, that we were concerned in adventures abroad as shareholders, capitalists, and debenture holders, and we also had a certain number of persons here who had served abroad and received pensions in consequence of those services. Moreover, we were a great carrying and manufacturing country. It might be that we should see a gradual increase of the *rentier* class in disproportion with the manufacturing energy which produces and manufactures exports. Referring to Mr. Glover's criticism of Professor Marshall's remarks, he thought what Professor Marshall meant was this: There were certain persons in this country who received foreign food products for their own satisfaction. It might be that their command in respect of what was owed them was such as really to supply all their wants in that direction, still there was something over which might be employed in having extra services of pleasure and luxury, which gave occupation to a certain number of persons at home; that is to say, the increase of *rentier* faculty of the receiver would relatively tend to a diminution of the imports of commodities, and possibly to the development of a class at home which performed services such as Professor Marshall anticipated. He (the President) did not agree with this view, because the class of persons thus given employment would themselves desire precisely the same kind of foreign commodities for their own satisfaction. Such an explanation would be insufficient to account for a relative falling off in exports, unless it was associated with some relative diminution of the productive energy which resulted from the exports of commodities in exchange for other commodities. And it seemed to involve a confession of the truth of the theory as to the growth of the *rentier* portion of the population at the expense of the manufacturing population. Another point Sir Robert Giffen referred to, on which he had hoped something more would have been said, but which was left to Mr. Birchenough to refer to, was the suggestion that the quantity of imports to which we were entitled might tend to diminish the energy of our exports. This could not of itself tend to diminish the relative energy of the manufacturing and exporting parts of the nation. A falling off in exports must be due to something quite independent of the circumstance that we were entitled to all these things on which we could live at our ease. He should think that there was going on some change in the circumstances, not in the energy of the population, which might make us relatively a less energetic and exporting country than we were before. Sir Robert Giffen told them quite accurately as a matter of past history, and possibly it might be true in the future, that such changes were compensated by new productions which could not be foretold beforehand, but which always came in to supply the place of industries which decayed. It might be that the future in this respect would follow the past. It might however be that the population remained energetic and yet was repressed by being placed in circumstances relatively less favour-

able than formerly to the development of energy. It might be that the acknowledged fact that the rate of increase in the popula-tion was slightly diminishing might in some way be connected with the abatement of industrial predominance. In conclusion, he urged upon Fellows of the Society in considering the paper not to rest content to notify phenomena, but to endeavour to ascertain the causes whence they sprung.

Sir ROBERT GIFFEN said that owing to the lateness of the hour he would do nothing more than return thanks for the cordial manner in which his paper had been received; and with the permission of the Editor of the *Journal* he would supply a few notes in writing upon the discussion itself, which would appear in the *Journal*.

The following notes have since been received:—

" I do not agree with the first speaker, Mr. Samuel, as to the Board of Trade returns not being themselves correct, or with his opinion that it would be a proper correction to deduct so much from the imports on account of freight. The object of the Board of Trade returns of imports and exports is not to show a balance of any sort, but to give information to merchants, manufacturers, and others as to the nature and amount of goods coming into the country, and the nature and amount of goods going out of the country; the values for this purpose being most conveniently stated, with regard to imports as at the place of arrival, and with regard to exports as at the place of departure. A line must be drawn somewhere, and it is for the convenience of traders who primarily make use of the returns of imports and exports that the line is drawn where it is. When the figures come to be used, however, in discussions as to the balance of trade, the true nature of the facts stated should be appreciated by all concerned, and for this purpose, although the returns of imports and exports are themselves correct enough, the facts as to freights and interest payable to this country require to be ascertained. It is altogether wrong therefore to speak of the returns as being erroneous because they cannot be used directly for showing a balance between imports and exports, since that is not the object for which they are primarily designed and used.

" I agree with Mr. Glover so much that I have hardly anything to say upon his remarks except to thank him for the way in which he endorsed the general argument of the paper. His knowledge of the shipowning business makes this endorsement very valuable. I am afraid I may have misquoted Professor Marshall, because I do not think that Professor Marshall made the statement to which Mr. Glover objects. He did not speak of the people of this country being saturated with imports generally. What he spoke of was their being saturated with certain kinds of imports, so that instead of wishing to import more things of those kinds, they preferred giving orders for articles or services of home production which they wanted in preference. The saturation Professor Marshall spoke of therefore is only relative saturation, and the idea is simply made use of to explain the reason for the direction

of peoples' energies towards home production rather than to manufacturing for export.

" Mr. Bateman, in his remarks, explains very clearly the general reasons for valuing imports at the place of arrival and exports at the place of departure, and the general reasons for not attempting to make a balance sheet of the import and export returns by themselves. The remarks should convince students like the first speaker, Mr. Samuel, that the points they referred to have been well considered time and again by those who are officially responsible for import and export statistics, and that there is very good reason indeed for the official practice. I agree with Mr. Bateman also in his last remark as to the increase of manufacture for home consumption, and his special reference to the large production of material for the defence of the country. The withdrawal of workers from ordinary industry for purposes of national defence is no doubt one reason for the exports at a given moment being less than they would otherwise be. This is no reason why the withdrawal should not take place if the national defence requires it; but we cannot eat our cake and have it; and if we give up some of our energies to the absolute defence of our existence and possessions, the less are we able to engage in other production.

" Mr. Fowler I have also the pleasure of agreeing with generally. It was not necessary for the special purpose of this paper, as explained at the outset, to go into the general question of the balance of trade. I am glad however that Mr. Fowler puts so clearly the point as to the mere fact of imports exceeding exports not being a bad thing, and not implying the consumption of our own capital, because if that implication were true we must long ago have consumed everything we had and be entirely bankrupt. This is so obvious, now that the excess of imports has been going on and steadily increasing for nearly half a century, that it is astonishing to find people still talking of the excess of imports in a way that might have been excusable when the thing was entirely novel. Now we know it is not an injurious thing, because the country goes on and prospers with it for generations. It may be added that even if the excess of imports did imply that we were withdrawing our capital from foreign countries, the further assumption that we were consuming our capital would not necessarily be true. The withdrawal might only mean that we were changing our investments; that we were investing more capital at home and withdrawing it from foreign countries for that purpose. We should not be consuming our capital unless it were found on balance that, putting home and foreign securities together, we were not adding to our investments. As we are certainly adding enormously every year to our investments at home, what people would have to prove to show that we were consuming our capital would be that the total withdrawals from foreign countries exceed the investments which are simultaneously being made at home, and no sort of proof of *this* proposition has ever been attempted.

" Mr. Pittar strengthened the remarks of Mr. Bateman as to the accuracy of the import and export returns, and, considering his

official position and responsibility for the returns themselves, no testimony could be more valuable. I quite agree with him also in his remark that we ought not to neglect new countries in our foreign trade, and I do not believe that in fact they are neglected, although our trade with the leading foreign nations may be the more important. There was great propriety also in the questions which he asked, first, as to whether there was not a set off in the foreign lines carrying British goods to the earnings which our own ships receive; and, second, as to whether allowance had been made for the coasting trade in my own estimates. As to the first of these questions, the answer is that in the method we have of dealing with our imports and exports, sufficient allowance is made for the earnings by foreign ships in carrying imports and exports into and from this country. In the paper of 1882 there is a note on p. 207 stating various cases as to an excess of imports or exports or the reverse arising in connection with carrying operations, and one of the cases there stated is this: 'A non-carrying nation, in the absence of borrowing or lending, ought to show in its accounts an equality between imports at the place of arrival and exports at the place of departure.' As far as goods carried in foreign ships are concerned, we are clearly a non-carrying nation, and the balance is accordingly as to such goods correctly struck by valuing imports at the place of arrival and exports at the place of departure. There is no set off then in this carrying by foreign ships to the earnings of our own mercantile fleet in the carrying trade of the world, including the conveyance of goods to and from the United Kingdom itself. With regard to the coasting trade, it is quite true that some deduction ought to be made from the general earnings of our mercantile fleet on account of that portion of the fleet which is engaged in the coasting trade. This point however I had in view both in my paper of 1882 and the present paper. The shipping employed in our coasting trade is however comparatively small, though it is not possible to state the amount exactly. The distinctions made in the shipping returns are three: shipping in the home trade, shipping partly in the home and partly in the foreign trade, and shipping in the foreign trade. The home trade in this definition is not merely the coasting trade, but includes trade with adjacent continental countries as well; but even the shipping thus engaged in what is called the home trade, while it is not all coasting, is of comparatively small amount. The deduction which is made in the paper from the figures which the statements would appear to show as the gross earnings of our fleet should be quite sufficient to cover these and other deductions, such as for expenditure in foreign ports, which ought to be made from the gross earnings of our ships in order to show the amount of these earnings receivable on home account. Points like this ought to be considered in using the figures, and should prevent us attempting to make any very exact estimate. It would not be possible however, unless in an elaborate research, to go minutely into them, and elaborate research is not really necessary to reach a conclusion on the main points.

" Mr. Bourne put the point which he also made in 1882 as to

a large portion of the receipts abroad being expended in the maintenance of our ships whilst there. I think however if he will refer both to my paper of 1882 and the present one he will find that this point is considered, as also his other point as to the earnings of our ships in trading between foreign countries or between the colonies and foreign countries.

" I appreciate very much the remarks of Mr. Birchenough. I hardly think that anything in the paper justifies him in saying that I spoke with 'somewhat light-hearted indifference' of the contingency of a decrease in our export trade; but that is almost the one point in his remarks to which I would take exception. The question is of the degree of importance we should attach to things, and I believe that although our foreign trade is most important, yet we must not speak of a decline in the foreign trade as a decline in our business generally. I agree especially with Mr. Birchenough in his suggestion that perhaps through the combined labour of a group of individuals they ought to be able to get at a closer knowledge of the element which went to make up those large excesses of imports over exports, and I hope the suggestion thus made will not be let slip by the younger members of the Society.

" I have to thank Mr. Courtney very especially for his kind and laudatory remarks. There is a point upon which we differ, as to the dependence of this country on the coal and iron trade. I do not attach quite the same importance as he does to the change which appears to be impending, and which, in fact, has already begun in the conditions of our coal and iron trade. But I agree with him altogether that the fact is a very important one, and gives rise for a great deal of consideration as to the future of this country. I agree with him generally also in the opinion that one effect of our receiving a large amount from foreign countries in payment of interest due to us must be to cause an increase of the *rentier* class in this country. The *rentier* class however must always exist quite apart from the question whether the interest is derived from foreign countries or not. Its existence depends upon the amount of capital held by a comparatively small number of individuals in a community as compared with the remainder. There may also be *rentier* classes of different kinds. Some may be more energetic than others, and instead of living upon their income, may use it very largely as a means of accumulation. So long as this is the case, the existence of a *rentier* class would not be very injurious to production; and there is reason to believe that a great deal of the interest received in this country both from foreign countries and from home investments is, in fact, devoted to accumulation, and not so much to personal expenditure. Generally however I agree very much with what Mr. Courtney said on this and other points.

" I desire, in conclusion, to express my thanks to the Assistant Secretary of the Society and his colleagues for the assistance they gave in the preparation of the tables, and also to my old colleagues at the Board of Trade for the abundant help which they also gave."

COMPARATIVE STATISTICS *of* AUSTRALASIAN RAILWAYS.

By PRICE HOWELL.

[Read (in the author's absence) before the Royal Statistical Society, 21st February, 1899. SIR COURTENAY BOYLE, K.C.B., Vice-President, in the Chair.]

BRITISH interests are largely centred in the successful working of the Australasian railways. For the greater portion of the public debt is absorbed in their construction, and it is from this source that a large part of the colony's revenue is provided.

All the railways (with the exception of a very small mileage) throughout the colonies are under Government control, and not only is the prosperity of each colony largely influenced by the results of the management of the various Commissioners, but the stability of the colony's finances is greatly enhanced by the increased net returns resulting from their efficient management.

The present time, when the question of federal control is being discussed, seems opportune for bringing before the notice of this Society particulars of the extent and working of the Australasian railways and the difference of procedure in each colony.

The railway question is the most important factor in the working out of the problem, and we need not go into the details of the early history of the colonial railways, to make an interesting comparison between State-owned lines and lines constructed and worked by private enterprise.

The extent to which the money borrowed by the colonies has been expended in railway construction is shown by the following statement of the proportion of expenditure on completed lines to the whole indebtedness of each colony up to 30th June, 1896:—

	Per Cent.		Per Cent.
New South Wales	59·19	Victoria	80·00
South Australia	56·72	Queensland	51·66
West ,,	48·91		
New Zealand (March, 1896)	35·97	Tasmania (December, 1895)	41·69

The railways being under the control of the various Commissioners in each colony, are not subject to any body such as the Board of Trade in England, or the Interstate Commerce Commission in the United States, for uniformity in the schedules of accounts; consequently in some instances comparative values cannot be arrived at by placing the figures of one report against another, and therefore various anomalies exist in returns of capital, revenue, and expenditure, as will be shown hereafter.

The accounts of the various Railway Commissioners in the Australasian colonies regard the railways, in most cases, only from the date when the lines are opened for traffic. In two cases however the constructing authorities take account of the interest accruing on loans from the time they are raised to the time the lines are completed, open for traffic, and earning revenue.

Although the primary object in these Government undertakings is to make the railways earn sufficient net revenue to cover their interest charges—where the State governs the railway system, lines must of necessity be constructed for the colony's welfare, which, if looked at from a revenue producing standpoint only, would not be attempted.

In the accounts dealing with the Victorian and South Australian railway capital, the expenses of floating the loans and discount in price of raising the money are fully debited to the cost of the undertaking. The aggregate deficiency of the railways in these two colonies to 30th June, 1896, was as follows :—

	Aggregate Net Earnings.	Aggregate Interest.	Deficiency in Meeting Interest.
	£	£	£
Victoria	22,432,645	30,191,898	7,759,253
South Australia	5,929,521	7,703,095	1,773,574

With regard to the South Australian figures, loans to the amount of 881,600*l.* have been finally paid off by the treasury from consolidated revenue. Although the colony is relieved of interest payments on that amount, as the payment of the loans have not been met from net railway revenue, credit should not be taken for these " paid offs " in making comparisons of net railway results on working capital.

The vast area of the Australian continent necessitates a far greater mileage of railway, in proportion to population, than that of any other country. The seven colonies of Australasia comprise an area of 3,077,377[1] square miles, exceeding that of the United States of America (Alaska excluded), which cover 2,970,000[2] square miles. When we consider the immense traffic that has to be dealt with by reason of the enormous population, and the long distances that the traffic is carried through the latter continent, and compare this with the small demands on the railways on account of the sparse population in the Australasian colonies, we cannot fail to recognise the efficient manner in which the colonial railways are conducted.

[1] Coghlan's " Seven Colonies of Australasia."
[2] Interstate Commerce Commission Report.

According to the report of the Interstate Commerce Commission, the estimated population of the United States on 30th June, 1893, was 66,551,571, with a mileage of railways of 26·51 miles per 10,000 inhabitants.   The population of the Australasian colonies on 31st December, 1895, numbered only 4,238,369 (Coghlan), having 30·50 miles of lines per 10,000 inhabitants (exclusive of private lines).   The tonnage of goods traffic dealt with for the year 1896 was as follows :—

	Tons.
United States	765,891,385
Australasia	10,923,839

The following table shows to what extent the railways in Australasia have developed during the past eight years.

Years 1888-96.

	Increase in Capital Expenditure.	Gross Revenue. Aggregate.	Working Expenses. Aggregate.	Net Earnings. Aggregate.
	£	£	£	£
New South Wales	9,129,446	22,692,498	13,495,895	9,196,603
Victoria	9,896,087	23,270,785	15,102,357	8,168,428
South Australia	3,187,910	8,321,653	4,654,160	3,667,493
Queensland (7½ years)	4,590,168	7,298,981	4,659,263	2,639,718
New Zealand	2,072,554	9,018,525	5,688,081	3,330,444
Tasmania	2,358,782	1,137,279	955,421	181,858
West Australia (from 1889)	1,483,741	1,224,196	802,624	421,572
Northern Territory (from 1890)	69,743	92,219	75,448	16,771

The total capital expended, net earnings and interest due, for the year 1896, are shown in the various reports as follows :—

Railways.	Capital Expended.	Interest.	Net Earnings.	Deficiency in meeting Interest.	Surplus.	Year ending.
	£	£	£	£	£	
New South Wales	36,852,194	1,295,590A or 1,377,535B	1,268,529	27,061A or 109,006B	—	June,'96
Victoria	38,108,151	1,438,603	854,917	583,685	—	,,
South Australia	12,583,443	468,375	403,478	64,897	—	,,
Queensland	16,759,406	693,911	441,132	252,779	—	,,
West Australia	2,316,824	94,533	265,911	—	171,378	,,
Tasmania	3,521,956	—	29,291	—	—	Dec., '95

The interest charges on the railway debts are worked out on different principles in each colony.

New South Wales Railway Report.

Here it is stated that the rate of interest is taken at the average rate the loans of the colony bear :—

    (A.) On the total capital expenditure, on lines open—less the
         moneys provided out of the consolidated revenue and
         the amount of debentures paid off.
    (B.) On the total capital expenditure on lines open.

Victorian Railway Report.

The loans for railway purposes, when issued, are debited in the
railway accounts, together with the discounts and expenses on sale
of debentures. The interest accruing while lines are in course of
construction is charged, a credit being taken on the unexpended
balances at the rate of $2\frac{1}{2}$ per cent. for 1896.

South Australian Railway Report.

As in Victoria, the loans for railway purposes are debited
against railways when issued, together with discounts and floating
charges. Full interest is debited from date of issue, no deduction
is made for interest on unexpended balances, but interest is reduced
by the amount of loans paid off by the Treasury. A departure
from the practice of the other colonies is made by South Australia
in charging the amounts of discounts and floating charges of the
railway loans against the capital cost of lines constructed, together
with a portion (56,035*l.*) of the interest incurred on loans during
construction.

Queensland Railway Report.

The amount of the interest on each railway loan is not set out
in the reports, but an interest charge of 4 per cent. on the capital
expenditure is taken, irrespective of whether the lines are open for
traffic or under construction.

West Australian Railway Report.

Specific loans for railway purposes, at par, on amounts
expended on lines open for traffic, are considered, but not the
cost of floating them. Interest is reckoned on the net amount of
the loans expended on lines open for traffic, and interest at the
rate of 4 per cent. is taken on amounts obtained from other
sources for the construction of railways.

Tasmanian Railway Report.

The amount of debentures raised for purposes of construction
are shown in the reports, but the amounts raised for surveys
(55,746*l.*), for deferred interest on the Launceston and Western
railway (48,000*l.*), and for main line guaranteed interest (87,577*l.*)
and the interest on these sums, are not included.

With all these varying circumstances operating, a true com-
parison of the net value of one colony's railways with those of
another cannot be formed on the figures published.

To enable us to arrive at an equitable basis on which the railways of one colony can be compared with those of another, the writer has prepared the following table, from figures compiled from the Treasury returns and from the railway reports of the various colonies. It takes account of what would be chargeable to the railways if interest on total cost of construction was charged (see "b" in statement, Table C), and (also) the actual interest for which each colony is chargeable for railway loans (see "a" in statement, Table C). For details making up these amounts see Tables Nos. III—V.

TABLE C.—*Financial Aspect of the Australian Railways on a Comparative Basis on 30th June, 1896. (Tasmania, December, 1895.)*

Railway.	Total Loans raised for Railway Purposes.	Discounts and Cost of Floating Loans (less premiums).	Net Amount available from Loans.	Less Interest Paid out of Loans.	Less Unexpended Balance.	Amount Expended on Construction.
	£	£	£	£	£	£
N. S. Wales	—	—	Not obtained	—	—	—
Victoria	36,732,845	548,697	36,184,148	—	1,069,307	35,114,841
South Australia	12,465,793*	433,623	12,032,170	56,035	358,572	11,617,563
Queensland........	18,631,652	1,135,482	17,496,170	—	148,390	17,347,780
Northern Territory.... }	1,162,780	5,461	1,157,409	136,597	9,764	1,011,048
West Australia	2,199,238	31,770	2,167,468	—	—	2,167,468
Tasmania	3,755,143	—	—	—	224,724	3,493,818

Railway.	Spent on Construction.			"a" Interest for Year. "b"		
	Net Amount from Loans.	From Consolidated Revenue or other sources.	Total.	On Loans Raised.	On Accounts Expended from other sources; taken at 3 %.	Total.
	£	£	£	£	£	£
N. S. Wales	—	—	Not obtained	—	—	—
Victoria	35,114,841	2,993,310	38,108,151	1,459,743	89,799	1,549,542
South Australia	11,617,563	476,222	12,093,785	468,375	14,287	509,110*
Queensland........	17,347,780	—	17,347,780	711,203	—	711,203
Northern Territory.... }	1,011,048	10	1,011,058	45,832	—	45,832
West Australia	2,167,468	149,356	2,316,824†	89,862	4,481	94,343
Tasmania	3,493,818	28,138	3,521,956	143,612	844	144,456
				The colonies' indebtedness		The indebtedness of the railways on full capital raised for railway construction

* Of the 12,465,793*l*. loans raised, 881,600*l*. has been finally paid off by the Treasury, thus relieving the colony's indebtedness by the interest on that amount; but as this has not been met from the railway net earnings, interest on the 881,600*l*. at 3 per cent. is included in the "Total "interest" column.

† On lines open only.

The Relation of Net Earnings to Capital.

To graphically illustrate the variations of net earnings in relation to capital of the railways in each colony comparatively, the diagram shown on Plate I has been prepared. In it the standard adopted is based on the working of the New South Wales railways for 1888.

The diagram on Plate II shows the comparative relation of working expenses to gross earnings for each colony's railways in the same manner.

[In reading these diagrams it will be observed that (in Plate I) if the net earnings increased annually in a corresponding ratio to the increase in capital, or (in Plate II) if the working expenses increased in corresponding ratio to the gross earnings—the same diagraphical line would apply in both cases for each sheet.]

As will be observed by reference to Plate II, the fluctuations in revenue and expenditure have been very great during the past twelve years, and this fact is most noticeable in the case of the two leading colonies.

From the years 1885 to 1891 the railway revenue in Victoria rose rapidly, the accumulated revenue during that period being 17,078,826*l.*, outstripping by far the revenue obtained by New South Wales. But, at the same time, it will be seen that the expenditure there during the same period increased at a greater ratio, amounting to 10,879,313*l.* or 63·70 per cent. Since that date the revenue has suffered as rapid a decline, so bringing the gross amount now to less than that obtained in 1887. At the same time the expenditure has been brought down in even a greater degree.

In New South Wales during the period 1885 to 1891 the accumulated revenue was 14,809,473*l.*, while the accumulated expenditure amounted to 9,613,111*l.*, equal to 64·91 per cent. of the total revenue.

For the period 1892 to 1896 inclusive, the accumulated amounts and ratio in the two colonies were as follows :—

Railway.	Accumulated Revenue, 1892-96 inclusive.	Accumulated Expenditure, 1892-96 inclusive.	Compared with previous Six Years.	
			Revenue.	Expenditure.
	£	£	% decrease.	% decrease.
Victoria	13,730,212	8,713,717	19·61	19·91
New South Wales	14,546,514	8,364,087	1·78	12·99

In considering the amounts which go to make up the gross earnings various circumstances are to be taken into account. Owing to the geographical position of some of the districts in New South Wales with which a large traffic is carried on, the railways of the adjoining colonies are in a position to secure a large share of that traffic, because their seaboard is much nearer, and the railways tap the borders of the colony. This is most noticeable in the case of the large mineral traffic at Broken Hill, which, although in fact, in New South Wales, is only in direct railway communication with South Australia. So the latter colony obtains all the traffic. Victoria is in a position to attract a large share of the wool traffic from the borders of the river Murray in New South Wales, owing to the short distance to Melbourne, as compared with the greater mileage to Sydney.

To compete for this traffic special preferential rates are in vogue in most of the colonies, and have been the cause of keen competition.

Other differences are in charges made for services performed by the railways for other Government departments, which are dealt with differently in each colony.

Queensland railways take the credit under this head for sums amounting to 33,469*l.* during the year, the departments which contributed this non-paying traffic being the Home, Defence, Justice, Treasury, Public Instruction, Public Lands, Mines, and Public Works. The post and telegraph departments are included in the paying traffic, though it is difficult to understand why these are not dealt with in a similar manner to the other Government departments. It was not till last year (1895) that the New Zealand Railway department took a book-keeping credit for services performed for other Government departments (non-paying traffic), and thereby increased the gross revenue to the extent of 36,152*l.* The railway department of South Australia takes credit for services rendered to other Government departments, except those rendered to Parliament, the judges, State children, scholars attending school outside residential areas, and a few minor items. The gross earnings of the West Australian railways include earnings from jetties.

The returns for Victoria and Tasmania do not include the value for services performed for other Government departments.

The extent of the railway systems and the volume of traffic carried on the New South Wales and Victorian railways together, are greater than those of the combined railways of all the other colonies. The combined capital expended on railways and the combined gross and net earnings for the year 1896 give a striking illustration of the extent of the operations in the two leading colonies, viz. :—

	Capital Expended.	Gross Earnings.	Net Earnings.
	£	£	£
New South Wales and Victorian railways .... }	74,960,345	5,221,809	2,123,446
All other Australasian Government railways .... }	51,820,071	3,949,398	1,571,301

A comparative table of statistics of all the Australasian Government railways for the year 1896 is shown in Table 1.

The cost of the lines per mile, including equipment, varies from 14,563*l*. for the 4 ft. 8½ in. gauge in New South Wales, down to 3,940*l*. for the 3 ft. 6 in. gauge in West Australia.

The principal causes affecting the cost of the New South Wales railways are the heavy continuous gradients, the substantial formation of the tracks, substantial station buildings and equipment, extensive interlocking and other safe-working appliances, the high price of labour and material when the principal lines were constructed, and the extent of double and quadruple track. On the other hand, the extremely low cost per mile in West Australia is due principally to the large mileage that has been laid down when labour and material were at a very low price; to the fact that in recent cases the contractors have built the lines at a very low rate, recouping themselves by carrying the glut of traffic for some considerable time from the time of completion of line to date of handing over to the Government. Moreover, in West Australia the tracks and buildings are of a light nature, and there are very few stations of importance.

The prime cost value of the railway properties is far higher than the monetary capital cost, for,—apart from the increased value by the creation of populated districts consequent upon having railway communication,—where the land taken for railway purposes is Crown property, under the usually heavy head of property acquired, nothing is debited against the railway capital.

The fact that the passenger and goods train mileage is not kept distinct, except in New South Wales and South Australia, prevents a fair comparison being made of the two classes of earnings throughout the colonies. Having regard to the total train miles run, a great disparity is seen in the various colonies. New South Wales railways obtain the highest earnings per train mile (7*s*. 3·68*d*.), taking the low rates of carriage into account; and the fact that New South Wales earns 191*l*. per average wagon (for the year 1896) with 3·68 wagons per mile of line, as against 136*l*. with 2·67 wagons per mile in Victoria, and 224*l*. for 1·42 wagons per mile in Queensland, shows the long distance traffic and heavy loads that are taken per train on the New South Wales lines.

The West Australian railways, for the length of lines open, have a heavy goods traffic, the average for the year being 3·85 wagons per mile of line, and they earn 153*l.* per wagon.

Gross earnings vary considerably, and may be taken in two groups as under :—

Year 1896.	Per Train Mile.	Per Mile of Line.	Year 1896.	Per Train Mile.	Per Mile of Line.
	s. *d.*	£		*s.* *d.*	£
New South Wales..	7 3·68	1,114	Victoria	5 4·11	769
West Australia	6 10·44	913	South Australia	5 8·57	573
New Zealand	7 1·85	592	Queensland............	4 6·91	456
			Tasmania	4 1·36	350

Net earnings take the following order of precedence :—

Year 1896.	Per Train Mile.	Per Mile of Line.	Year 1896.	Per Train Mile.	Per Mile of Line.
	s. *d.*	£		*s.* *d.*	£
New South Wales..	3 3·44	501	South Australia	2 4·04	234
West Australia	3 5·39	458	Victoria....................	1 10·82	274
New Zealand	2 7·32	216	Queensland	1 10·32	185

Working Expenses.

The plans adopted in setting out the details in the schedules of working expenses are not uniform in each colony, and render difficult a comparison of one report with another. In Table I the items have been classified to make as uniform a comparison throughout as is possible; where the item "sundries" occurs, it has been divided *pro rata* over wages and materials.

For the five years 1892 to 1896 inclusive, the amounts spent on maintenance of way and works, per train mile, were as follows :—

New South Wales.	Victoria.	South Australia.	Queensland.	New Zealand.
s. *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*
1 1·32*	– 8·23	– 10·01	1 3·60	1 8·41

* Includes cost of completely relaying 319 miles of main line railway.

while for the year 1896 the expenditure under that head ranged from 1*s.* 8·51*d.* in New Zealand to 9·39*d.* in South Australia.

General Charges.

Included under this heading, as shown in Table I for the Victorian figures, are "pensions and gratuities," which are mount-

ing up rapidly and threaten to be a great burden on the working expenses. The amounts thus charged for the five years were as follows :—

1892.	1893.	1894.	1895.	1896.
£ 50,047	£ 60,629	£ 77,854	£ 80,203	£ 89,737

An entire alteration has been made in the schedules of working expenses in the last annual report of the New Zealand railways, the expenses of the departmental offices, amounting to 23,496*l.*, being grouped under one heading. So the branch departments are thus under charged by this amount. But, as a set-off against this, credit recoveries, 16,818*l.*, are also put under a separate heading instead of being distributed over the individual branches to which they belong.

Diagrams designed by the writer, showing the relative variation of branch working expenses and net earnings, in proportion to gross earnings and per train mile, for all the colonies, are shown on Plates III and IV.

Locomotives.

Particulars of all the principal types of locomotives in use on the railways in the Australian colonies are shown on pp. 94—99. A profile of the main trunk line from Adelaide (South Australia) to Brisbane (Queensland) is shown on Plate X, by which an idea can be formed of the nature of the country traversed.

The hauling power of the principal types of engines on the New South Wales lines is given on p. 94.

[From the New South Wales Railway Commissioners' Annual Report, 1895. p.6.]

Grade.	"P" Class.				"J" Class.		"T" Class.	
	Working Passenger Trains.		Working Goods Trains.		Working Goods Trains.		Working Goods Trains.	
	Tons Hauled.	Speed per Hour.	Tons Hauled.	Speed per Hour.	Tons Hauled.	Speed per Hour.	Tons Hauled.	Speed per Hour.
		miles.		miles.		miles.		miles.
1 in 40	225	20	275	10	350	10	350	10
1 ,, 75	260	30	505	12	580	12	615	12
1 ,, 100	255	35	600	15	620	15	700	15
1 ,, 150	330	35	700	18	650	18	750	18

Some very heavy gradients are met with on the Northern and Western lines of New South Wales; on the former line, from

Farquharson to Ben Lomond, a distance of 100 miles, a mean rise of 3,090 feet is met before reaching summit level.

On the Western line, up the Blue Mountains, between Emu Plains and Blackheath, a distance of 37 miles, a mean rise of 3,407 feet has to be negotiated.

Lengths and altitudes of the steepest gradients on the main lines in each colony are given in the following table :—

Table of Steepest Gradients on Main Lines in each Colony.

NEW SOUTH WALES.	Mean Altitude between Stations named.		NEW ZEALAND.	Mean Altitude between Stations named.	
	ft.	miles.		ft.	miles.
Emu Plains to Blackheath	3,407 in	37	Belmont to Summit	1,088 in	24
,, Glenbrook	510 ,,	4	Sheffield to Springfield............	288 ,,	6
The Great Zig-Zag	588 ,,	4	Port Chalmers to Mihiwaka	283 ,,	4
Farquharson to Ben Lomond	3,090 ,,	100	Mangatera to Mataman	282 ,,	5
Balmoral to Hill Top	526 ,,	4	New Plymouth to Midhurst	1,122 ,,	27
VICTORIA.					
Cowsley to Ingliston....................	987 ,,	11	QUEENSLAND.		
Ballarat East to Warrenheip ...	312 ,,	3¾	Gowrie Jn. to Toowoomba	344 ,,	8
Sunbury to Woodend	1,138 ,,	24¾	Murphy's Creek to Harlaxton	1,220 ,,	16
Glenroy to Kilmore Junction	834 ,,	24½	Grandchester to Victoria........	298 ,,	14
			114 mile to Wallangarra	588 ,,	10
SOUTH AUSTRALIA.			111 mile to 109 mile................	197 ,,	2
Wellington to Nairne....................	948 ,,	10	Maryland to Dalveen	309 ,,	3½
Woodwood to Mount Lofty	1,535 ,,	16			

The average annual repairs and renewals to locomotives, covering a period of five years 1892 to 1896, are as under :—

		Wages and Materials.		Materials only.		Total Repairs to Revenue.
		Per Train Mile.	Per Engine.	Per Train Mile.	Per Engine.	
	ft. in.	*d.*	£	*d.*	£	Per cnt.
N.S. Wales	4 8½ gauge	4·97	309	1·15	72	23·25
Victoria.........................	5 3 ,,	2·49	213	0·48	41	19·07
S. Australia 3 6 and	5 3 ,,	3·80	207	1·02	57	26·83
Queensland	3 6 ,,	1·57	96	0·37	29	29·90*
New Zealand	3 6 ,,	4·45	216	1·63	81	37·59

* Average over four years.

Principal Types of Locomotive

Class Letter.	Maker.	Cylinders.		Working Boiler Pressure.	Diameter of Wheels.		Heating Surface.		
		Diameter.	Stroke.		Bogie.	Coupled.	Tubes.	Fire-box.	Total.
	NEW SOUTH WALES.	ins.	ins.	lbs. per sq. in.	ft. in.	ft. in.	sq. ft.	sq. ft.	sq. ft
J	Baldwin Co., America	21	26	160	2 6	4 3	1,809	158	1,967
P {	Beyer, Peacock & Co., Manchester. }	20	26	160	3 3	5 —	1,786	130	1,916
T	„ „	21	26	160	2 9½	4 3	2,045	166	2,211
	VICTORIA.								
A {	Phœnix Foundry Co., Ltd., Victoria }	18	26	140	3 6	6 —	1,056	95	1,151
D	„ „	17	26	140	3 6	5 —	971	83	1,054
R {	Robison, Campbell & Sloss, Victoria }	17	26	140	—	4 6	971	83	1,054
X {	Phœnix Foundry Co., Ltd., Victoria }	18	26	140	—	5 —	1,313	103·7	1,416·7
Y	„ „	18	26	140	—	4 6	1,056	95	1,151
E {	Robison, Campbell & Sloss, Victoria }	17	26	140	{ radial 3 6 }	5 —	971	83	1,054
	SOUTH AUSTRALIA.								
K {	Beyer, Peacock & Co., England .... }	16½	20	130	—	4 —	830·79	89·38	920·17
P {	J. Martin & Co., S. Australia............ }	16	20 {	& 130 145 }	—	5 —	847·12	87·49	934·61
R {	Dubs & Co., Scotland .... J. Martin & Co., S. Australia............ }	18	24 {	& 130 145 }	2 11	4 6	1,195·68	98·30	1,293·98
S	„ „	18	24	145	2 11	6 6	1,123·14	107·52	1,230·66
W {	Beyer, Peacock & Co., England .... }	12	20	130	2 —	3 3	498·68	45·42	544·10
Y {	J. Martin & Co., S. Australia............ }	14½	20 {	& 130 145 }	2 —	3 3	708·46	69·48	777·94
Z	„ „	15	20	145	2 3	4 6	795·22	73·93	869·15
	QUEENSLAND.								
A 12 {	Baldwin & Co. .... Evans, Anderson, Phelan & Co., Queensland........	12	18	120	2 2	4 —	493	60	553
A 14 {	Phœnix Engineering Co., Queensland	14	20	140	2 2	4 3	617	72	689
B 13 {	Kitson & Co., England .... Dubs & Co., Scotland .... Phœnix Engineering Co., Queensland	13	20	120	2 —	3 3	530	65	595

n use on Australian Railways.

Total Grate Area.	Weight in Working Order.			Water Capacity.	Coal Capacity.	Tractive Power at 80 per Cent. of Boiler Pressure.	Gauge.
	Engine.	Tender.	Total.				
sq. ft.	tons cwt. qrs.	tons cwts. qrs.	tons cwts. qrs.	gals.	tons.		ft. in.
32·0	62 12 2	34 10 2	97 3 –	3,650	6	28,777	⎫
27·0	56 10 3	31 16 1	88 7 –	3,030	4½	22,187	⎬ 4 8½
29·75	62 15 –	41 – –	103 15 –	3,650	6	28,777	⎭
21·0	43 – –	30 – –	73 – –	2,200	3½	13,104	⎫
17·8	40 – –	30 – –	70 – –	2,200	3½	14,026	
17·8	38 – –	30 – –	68 – –	2,200	3½	15,585	
21·7	42 – –	26 – –	68 – –	2,250	3½	15,725	⎬ 5 3
21·0	40 – –	30 – –	70 – –	2,200	3½	17,472	
17·8	50 – –	—	50 – –	1,600	2½	14,026	⎭
15·0	40 12 –	—	40 12 –	1,060	1¾	11,798	⎫
14·67	32 12 –	—	32 12 –	600	¾ {	8,875 9,899	
17·60	39 17 1	24 5 –	64 2 1	2,040	5 {	14,976 16,704	⎬ 5 3
17·37	38 9 –	24 5 –	62 14 –	2,040	5	11,564	⎭
9·76	18 10 –	10 16 1	29 6 1	850	2¼	7,680	⎫
13·67	24 5 2	17 8 2	41 14 –	1,600	3¾ {	11,213 12,507	⎬ 3 6
13·87	27 1 –	17 8 2	44 9 2	1,600	3¾	9,667	⎭
10·8	22 1 –	15 2 –	37 3 –	1,000	4	5,184	⎫
13·0	27 9 –	20 5 –	47 14 –	1,400	3½	8,609	⎬ 3 6
10·5	22 17 –	22 5 –	45 2 –	1,400	4	8,320	⎭

Principal Types of Locomotive

Class Letter.	Maker.	Cylinders.		Working Boiler Pressure.	Diameter of Wheels.				Heating Surface.		
		Diameter.	Stroke.		Bogie.		Coupled.		Tubes.	Fire-box.	Total.
	QUEENSLAND—*Contd.*	ins.	ins.	lbs. per sq. in.	ft. in.		ft. in.		sq. ft.	sq. ft.	sq. ft.
B 15	Nasmyth, Wilson & Co., England .... Yorkshire Engineering Co., England .... Evans, Anderson, Phelan & Co., Queensland .... Walkers, Ltd., Queensland	15	20	140	2	–	3	–	740	80	820
C 16	Baldwin & Co., America	16	20	120	2	–	3	–	865	86	951
A	TASMANIA. Beyer, Peacock & Co., England	15½	22	150	2	4½	4	7	781	80	861
B	„ „	14½	20	140	2	–	4	–	704	70	774
C	„ „	14½	20	140	2	–	3	3	704	67½	771½
D	„ „	12½	20	140	2 – leading 3 – trailing		3	9	518	57	575
A	WEST AUSTRALIA. Beyer, Peacock & Co., England .... Dubs & Co., Scotland	12	20	130	2	–	3	3	496	54	550
B	Kitson & Co., England .... Dubs & Co., Scotland .... Kitson & Co., England	14	21	140	2	–	3	1	637 {	59 75 75	696 712 712
G	Beyer, Peacock & Co., England .... Neilson & Co., England .... J. Martin & Co., S. Australia............	14½	20	140	2	–	3	3	708	72	780
G	Beyer, Peacock & Co., England .... Dubs & Co., Scotland	14½	20	140	2	–	3	3	708	72	780
K	Neilson & Co.	17	21	160	2	1	3	2	920	93	1,013
N	„	15½	21	160	2	3	4	–	778	89	867
O	„	15½	21	160	2	3	3	–	778	89	867
R	Dubs & Co.	16	22	160	2	3	4	9	819	88	907
T	Beyer, Peacock & Co., England .... Kitson & Co., England	15	20	140	2	3½	4	4	767	78	845

in use on Australian Railways—Contd.

Total Grate Area.	Weight in Working Order.			Water Capacity.	Coal Capacity.	Tractive Power at 80 per Cent. of Boiler Pressure.	Gauge.
	Engine.	Tender.	Total.				
sq. ft.	tons cwts. qrs.	tons cwts. qrs.	tons cwts. qrs.	gals.	tons.		ft. in.
13·0	27 19 –	23 15 –	51 14 –	1,700	4	14,000	⎱ 3 6 ⎰
17·79	29 6 –	19 11 –	48 17 –	1,350	5	13,654	
15·75	29 15 –	20 10 –	50 5 –	1,700	2¼	11,532	⎱ 3 6 ⎰
14·33	26 5 –	20 10 –	46 15 –	1,700	2¼	9,812	
13·66	25 10 –	20 10 –	46 – –	1,700	2¼	12,076	
10·87	28 10 –	—	28 10 –	600	¾	7,777	
9·7	19 12 –	10 15 –	30 7 –	832	1½	7,680	
10·4 ⎱ 12·5 ⎰ 12·5	32 – –	—	32 – –	600	1½	12,621	
14·6	25 4 –	16 18 –	42 2 –	1,200	2	12,076	⎱ 3 6 ⎰
14·6	26 15 –	16 18 –	43 13 –	1,200	2	12,076	
16·7	53 – –	—	53 – –	2,000	2¾	20,443	
15·75	44 4 –	—	44 4 –	1,600	2½	13,464	
15·75	34 10 –	23 19 –	58 9 –	2,500	5	17,939	
16·28	31 16 –	23 19 –	55 15 –	2,000	5	12,647	
14·6	29 16 –	20 – –	49 16 –	1,700	2½	9,692	

Principal Types of Locomotives in

Class Letter.	Maker.	Cylinders.		Working Boiler Pressure.	Diameter of Wheels.				Heating Surface.		
		Diameter.	Stroke.		Bogie.		Coupled.		Tubes.	Fire-box.	Total.
		ins.	ins.	lbs. per sq. in.	ft.	in.	ft.	in.	sq. ft.	sq. ft.	sq. ft.
	NEW ZEALAND.										
B	New Zealand Government	16	22	175	2	6	3	6¼	939	109	1,048
D	Various English makers	9½	18	140	1	6	3	-½	360	34	394
F	„ „	10½	18	130	—		3	-½	413	45	458
FA	New Zealand Government	12	18	160	—		3	-½	480	50	530
J	Various English makers	14	20	140	2	-¼	3	6¼	629	57	686
LA	New Zealand Government	12	18	160	2	2½	3	6¼	535	50	585
N	Baldwin & Co., America	15	20	135	2	4½	4	1⅛	804·2	83·5	487·7
O	„ „	15	18	130	2	4½	3	-¼	802	74·5	876·5
P	Nasmyth Wilson, England	15	20	140	2	2½	3	5	780	78	858
T	Baldwin & Co., America	15	18	130	2	1¼	3	-¼	737·6	74·8	812·4
U	New Zealand Government	16	20	160	2	6	4	6	885	87	972
V	Nasmyth Wilson, England	15	20	140	2	2½	4	1⅛	780	78	858
W	New Zealand Government	14	20	150	2	2½	3	-½	629·1	53·7	682·8
WA	„ „	14	20	160	2	4½	3	3¾	680	60	740

use on Australian Railways—Contd.

Total Grate Area.	Weight in Working Order.			Water Capacity.	Coal Capacity.	Tractive Power at 80 per Cent. of Boiler Pressure.	Gauge.
	Engine.	Tender.	Total.				
sq. ft.	tons cwt. qrs.	tons cwt. qrs.	tons cwt. qrs.	gals.	tons.		ft. in.
17·3	42 18 —	22 — —	64 18 —	1,700	cubic ft. 140	18,662	⎫
8·0	17 — —	—	17 — —	300	22	4,985	⎪
9·0	20 — —	—	20 — —	450	40	5,655	⎪
10·7	24 — —	—	24 — —	600	48	9,090	⎪
12·0	24 — —	17 — —	41 — —	1,200	120	10,391	⎪
10·7	26 12 —	—	26 12 —	650	34	7,853	⎪
16·0	30 15 —	19 10 —	50 5 —	1,400	120	9,918	⎬ 3 6
15·2	29 5 —	19 10 —	48 15 —	1,300	120	11,700	⎪
15·8	32 10 —	21 10 —	54 — —	1,400	140	12,293	⎪
15·7	28 5 —	17 10 —	45 15 —	1,300	140	11,700	⎪
16·0	38 — —	23 10 —	61 10 —	1,900	125	12,136	⎪
15·8	32 — —	21 10 —	53 10 —	1,400	140	10,300	⎪
12·0	37 5 —	—	37 5 —	900	72	12,888	⎪
12·5	37 5 —	—	37 5 —	800	70	12,623	⎭

Ton-Miles.

If the system universally adopted in America of working out the ton-miles of all goods carried, and the passenger unit-miles, were followed out on all the Australasian railways, a more accurate opinion of the extent of accommodation for each class of traffic could be formed.

At present New South Wales, Tasmania, and South Australia are the only Australasian colonies where the railways prepare statements of the ton-miles; New Zealand formerly took account of the ton-miles on the principal lines, but has now ceased to do so.

For the reasons that the railway systems extend over so large an area in the colonies, and that in some cases heavy suburban traffic is carried only short distances, the total tonnage carried forms no criterion of the extent of traffic transported, as the distance carried fluctuates considerably. For example, during the year 1896 New South Wales railways carried 4,061,131 tons an average of 63·94 miles, while South Australian railways carried 1,056,963 tons an average of 127·58 miles—the total tons carried by the former being 3·84 times greater than that of South Australia, while the volume of traffic transported, when distance carried is taken into account, was only 1·93 times as great.

The revenue earned also shows a wide difference in the respective colonies as under:—

	New South Wales.		South Australia.	
	s.	d.	s.	d.
Per ton carried	7	8·10	12	8·35
,, mile	–	1·44	–	1·19

In the statements of tonnage carried for 1896 the Queensland and West Australian railway reports do not include tonnage of live stock in total tonnage, but all the other colonies include this class of traffic in the total goods tonnage.

The great reductions in rates of carriage that have taken place on the New South Wales lines within recent years, have not only induced a greater volume of traffic, but have caused agricultural and other pursuits to be carried on further inland.

Grain and Flour.—During the year 1879, 36,249 tons were carried an average distance of 99·63 miles, at a rate of 1·03*d.* per ton per mile; the rate of carriage has been reduced recently until in the year 1895 the rate was reduced to 0·58*d.* per ton-mile, which has admitted of the profitable cultivation of land further inland, the average distance this year being 158·58 miles, when

over seven times the quantity of grain was carried, viz., 267,593 tons.

This principle has been adopted with regard to other classes of traffic : hay, straw, and chaff were carried to the extent of 22,467 tons, an average distance of 33·10 miles, at a cost of 1·48*d.* per ton-mile in 1879; inducements were offered by the reductions in rates of carriage to place more land under hay, so that in 1895, with a rate reduced as low as 0·42*d.* per ton-mile, 88,581 tons were carried an average distance of 170·94 miles, the quantity being 6·34 times greater, and the distance 5·17 greater than the corresponding figures in 1879.

In live stock the tonnage has increased 6·47 times—27,805 tons being carried in 1879, as against 179,823 tons in 1895; and the distance conveyed was just doubled, 134·01 as against 268·32 miles, whilst the rates per ton-mile were 2·86*d.* in 1879 and 1·79*d.* in 1895. Other classes of traffic have been dealt with similarly, but there are no statistics available to show the results.

I am indebted to the following gentlemen for information in the compilation of returns contained in this paper, viz.:—Mr. T. Roberts, Loco. Engineer, South Australian Railways ; Mr. T. H. Woodroffe, Chief Mechanical Engineer, Victorian Railways ; Mr. T. F. Rotheram, Loco. Superintendent, New Zealand Railways ; Mr. H. Horniblow, Loco. Engineer, Queensland Railways ; Mr. R. B. Campbell, Loco. Engineer, West Australia Railways ; Mr. W. E. Batchelor, Loco. Superintendent, Tasmanian Railways ; The Under Secretary for the Treasury, Brisbane ; Mr. Alpin P. Thomson, Under Secretary for Railways and Works, Perth, West Australia ; Mr. A. Day, Secretary for Railways, Adelaide, South Australia, and Mr. R. G. Kent, Secretary for Railways, Melbourne, &c.

NOTE.—It should be remarked that after the diagrams were prepared and reproduced, a substantial reduction in the Queensland rates was accomplished. This (though necessarily, under the circumstances), disregarded in the diagram, has, as far as possible, been read into the text under the author's direction.—ED.

TABLE I.—*Comparative Statistics of the*

			New South Wales.	Victoria.
Year ending....	—		June.	June.
CAPITAL EXPENDED.				
Lines open .... { Total		£	36,852,194	38,108,151
{ Per mile		£	14,563	12,272
ROLLING STOCK.				
Locomotives.				
Total	—	No.	521	517
Number per mile worked	—	No.	0·20	0·17
Average mileage run................ Per engine		Miles	20,913	22,354
„ earnings .... „		£	5,368	4,525
Carriages.				
Total (productive to revenue)	—	No.	851	1,096
Number per mile worked........	—	No.	0·34	0·35
Average earnings .... Per carriage		£	1,200	1,097
Wagons.				
Total (productive to revenue)	—	No.	9,314	8,339
Number per mile worked	—	No.	3·68	2·67
Average earnings .... Per wagon		£	191	136
TRAIN MILES .... { Total		Miles	7,719,618	8,989,391
{ Per mile of line		Miles	3,050	2,880
RAILWAY EARNINGS.				
Passengers, &c.	—	£	1,021,176	1,202,258
Goods, &c.	—	£	1,775,784	1,137,174
Other receipts	—	£	23,457	61,960
Total		£	2,820,417	2,401,392
Passenger earnings .. .. { Per mile of line ...		£	403	385
{ „ train mile ...		s. d.	2/7·75	2/8·10
Goods, &c., „ .... { „ mile of line ...		£	702	364
{ „ train mile ...		s. d.	4/7·21	2/6·36
Other receipts .... { „ mile of line....		£	9	20
{ „ train mile ...		s. d.	–/0·72	–/1·65
Total earnings .... { „ mile of line		£	1,114	769
{ „ train mile ...		s. d.	7/3·68	5/4·11

Australasian Government Railways, Year 1896.

South Australia.	Queensland.	New Zealand.	Tasmania.	West Australia.	Northern Territory.
June.	June.	March.	Dec., 1895.	June.	June.
12,583,443	16,759,406	15,487,219	3,521,956	2,316,824	1,151,223
7,305	7,024	7,694	8,390	3,940	7,912
308	275	270	61	74	6
0·18	0·12	0·14	0·14	0 13	0·04
15,540	18,836	15,728	15,222	—	7,089
3,115	3,947	4,230	2,242	6,800	2,154
289	328	509	204	107	5
0·17	0·14	0·25	0·48	0·18	0·03
999	990	872	309	1,517	754
5,618	3,390	8,319	898	2,232	133
3 26	1·42	4·16	2·10	3·85	0·91
119	224	84	82	153	69
3,452,648	4,744,734	3,307,226	727,577	1,541,750	31,721
2,004	1,993	1,655	1,703	2,658	218
288,594	324,790	443,970	63,006	162,343	3,772
670,961	760,704	698,115	73,738	340,851	9,149
26,945	—	40,956	12,898	26,422	2,184
986,500	1,085,494	1,183,041	149,642	529,616	15,105
168	136	222	148	280	26
1/8·06	1/4·43	2/8·22	1/8·78	2/1·27	2/4·54
390	320	349	172	588	63
3/10·64	3/2·48	4/2·66	2/0·32	4/5·06	5/9·22
15	—	21	30	45	15
-/1·87	—	-/2·97	-/4·26	-/4·11	1/4·52
573	456	592	350	913	104
5/8·57	4/6·91	7/1·85	4/1·36	6/10·44	9/6·28

TABLE I *Contd.—Comparative Statistics of the*

			New South Wales.	Victoria.
	Year ending....	—	June.	June.
WORKING EXPENSES.				
Maintenance of Way and Works.				
Salaries, office expenses, &c.	Total	£	27,630	Wages, 290,641
Maintenance of way { Wages	,,	£	223,314	
Maintenance of way { Material	,,	£	52,410	
Bridges, stations, buildings	,,	£	37,439	Materials, 75,207
Sundries	,,	£	10,171	
Total way and works	—	£	350,964	365,848
	Per mile of line	£	139	117
	,, train mile	s. d.	—/10·91	—/9·77
	,, cent. of gross earnings	Per cent.	12·44	15·24
Locomotive Expenses.				
Superintendence, office expenses, &c.	Total	£	24,773	11,600
	Per engine	£	48	22
	,, train mile	d.	0·77	0·31
Running expenses { Wages	Total	£	226,553	196,819
	Per engine	£	435	381
	,, train mile	d.	7·04	5·26
Running expenses { Fuel	Total	£	71,488	117,970
	Per engine	£	137	228
	,, train mile	d.	2·22	3·15
Water, oil, and tallow	Total	£	38,622	26,392
	Per engine	£	74	51
	,, train mile	d.	1·20	0·70
Repairs and renewals { Wages	Total	£	132,007	78,207
	Per engine	£	253	151
	,, train mile	d.	4·11	2·09
Repairs and renewals { Materials	Total	£	38,939	19,502
	Per engine	£	75	38
	,, train mile	d.	1·21	0·52
Wages and materials	Total	£	170,946	97,709
	Per engine	£	328	189
	,, train mile	d.	5·32	2·61
Total locomotive power	Total	£	532,382	450,490
	Per engine	£	1,022	871
	,, train mile	s. d.	1/4·55	1/0·03
	,, cent. of gross earnings	Per cent.	18·88	18·76
	,, mile of line	£	210	144
Carriage and Wagon Repairs	Total	£	143,799	88,258
	Per train mile	d.	4·47	2·36
	,, cent. of gross earnings	Per cent.	5·10	3·68
	,, mile of line	£	57	28

Australasian Government Railways, Year 1896.

South Australia.	Queensland.	New Zealand.	Tasmania.	West Australia.	Northern Territory.
June.	June.	March.	Dec., 1895.	June.	June.
17,006	11,163	{ Combined under special heading }	—	—	1,018
		140,815	—	—	
		60,039	—	—	
118,063	237,304	78,496	—	—	9,624
		3,243	—	—	
135,069	248,467	282,593	46,548	56,036	10,642
78	105	141	109	97	73
–/9·39	1/0·57	1/8·51	1/3·35	–/8·73	6/8·52
13·69	22·89	23·89	31·10	10·58	70·45
12,320	7,515	{ Combined under special heading }	—	—	268
40	27	—	—	—	45
0·85	0·38	—	—	—	2·02
85,964	76,816	75,646	—	—	894
279	279	280	—	—	149
5·98	3·89	5·49	—	—	6·77
45,248	44,308	41,890	—	—	454
147	161	155	—	—	76
3·15	2·24	3·04	—	—	3·44
17,964	15,082	8,689	—	—	146
58	55	32	—	—	24
1·25	0·76	0·63	—	—	1·10
41,457	20,004	39,974	—	—	459
135	73	148	—	—	76
2·88	1·01	2·90	—	—	3·47
18,626	10,104	19,469	—	—	63
60	37	72	—	—	11
1·29	0·51	1·41	—	—	0·48
60,083	30,108	59,443	—	—	522
195	110	220	—	—	87
4·17	1·52	4·31	—	—	3·95
221,579	173,829	185,668	38,381	101,692	2,284
719	632	687	629	—	381
1/3·40	–/8·79	1/1·47	1/0·66	1/3·83	1/5·28
22·47	16·01	15·69	25·65	19·20	15·12
129	73	93	90	175	16
62,882	29,467	54,693	—	—	257
4·37	1·49	3·97	—	—	1·95
6·37	2·72	4·62	—	—	1·70
37	12	27	—	—	2

Table I *Contd.*—*Comparative Statistics of the*

			New South Wales.	Victoria.
Year ending...		—	June.	June.
WORKING EXPENSES—*contd.*				
Traffic Expenses (including oiling and greasing)	Total	£	413,130	499,583
	Per train mile	s. d.	1/1·78	1/1·34
	,, cent. of gross earnings	Per cent.	15·71	20·80
	,, mile of line	£	175	160
General Charges (including gratuities and pensions)	Total	£	64,757	134,776
	Per train mile	d.	2·01	3·60
	,, cent. of gross earnings	Per cent.	2·30	5·61
	,, mile of line	£	26	43
Compensation	Total	£	15,248	7,321
	Per train mile	d.	0·47	0·19
	,, cent. of gross earnings	Per cent.	0·54	0·31
	,, mile of line	£	6	3
Departmental Offices (not charged against each branch)	Total	£	—	—
	Per train mile	d.	—	—
	,, cent. of gross earnings	Per cent.	—	—
	,, mile of line	£	—	—
Credit Recoveries (not credited to individual branches)	Total	£	—	—
	Per train mile	d.	—	—
	,, cent. of gross earnings	Per cent.	—	—
	,, mile of line	£	—	—
TOTAL WORKING EXPENSES	Total	£	1,551,888	1,546,475
	Per train mile	s. d.	4/0·24	3/5·29
	,, cent. of gross earnings	Per cent.	55·02	64·40
	,, mile of line	£	613	495
NET EARNINGS	Total	£	1,268,529	854,917
	Per train mile	s. d.	3/3·44	1/10·82
	,, cent. of gross earnings	Per cent.	44·98	35·60
	,, mile of line	£	501	274
	Average per cent. to capital cost	Per cent.	3·44	2·24
GROSS EARNINGS	Total	£	2,820,417	2,401,392
	Per train mile	s. d.	7/3·68	5/4·11
	,, mile of line	£	1,114	769
ACCIDENTS (whether from own want of caution or not).				
To passengers	Killed	—	1 in 10,502,524	1 in 13,664,599
	Injured	—	1 ,, 420,109	1 ,, 397,998
,, employees	Killed	—	1 ,, 1,218	1 ,, 1,106
	Injured	—	1 ,, 125	1 ,, 65
TOTAL MILES OPEN		Miles	2,531¼	3,122¼
AVERAGE ,,		Miles	2,531¼	3,121

Australasian Government Railways, Year 1896.

South Australia.	Queensland.	New Zealand.	Tasmania.	West Australia.	Northern Territory.
June.	June.	March.	Dec., 1895.	June.	June.
146,127	166,966	207,253	29,891	94,389	1,805
–/10·16	–/8·44	1/3·04	–/9·86	1/2·69	1/1·65
14·81	15·38	17·52	19·98	17·82	11·95
85	70	104	70	163	12
15,841	25,633	14,483	5,531	11,588	300
1·10	1·30	1·05	1·82	1·80	2·27
1·61	2·36	1·22	3·69	2·19	1·99
9	11	7	13	20	2
162	Included	Included	—	—	1
0·01	under other	under other	—	—	—
0·02	heads	heads	—	—	0·01
—			—	—	—
—	—	23,496	—	—	—
—	—	1·71	—	—	—
—	—	1·99	—	—	—
—	—	12	—	—	—
—	—	16,818	—	—	—
—	—	1·22	—	—	—
—	—	1·42	—	—	—
—	—	8	—	—	—
583,022	644,362	751,368	120,351	263,705	15,289
3/4·53	2/8·59	4/6·53	3/3·69	3/5·05	9/7·67
59·10	59·36	63·51	80·42	49·79	101·22
339	271	376	282	455	105
403,478	441,132	431,673	29,291	265,911	Loss 184
2/4·04	1/10·32	2/7·32	–/9·67	3/5·39	—
40·90	40·64	36·49	19·58	50·21	—
234	185	216	68	458	—
3·21	2·63	2·80	0·83	11·48	—
986,500	1,085,494	1,183,041	149,642	529,616	15,105
5/8·57	4/6·91	7/1·85	4/1·36	6/10·44	9/6·28
573	456	592	350	913	104
Nil		1 in 4,162,426			Nil
1 in 2,717,978	Not	1 ,, 320,187	Not	Not	,,
Nil	published	1 ,, 995	published	published	,,
1 in 120	in report	1 ,, 44	in report	in report	,,
1,722¼	2,386	2,013	419¾	588	145½
1,722½	2,380	1,998	427¼	580	145½

TABLE II.—*Railway Rates for the Principal*

Colony.	Class of Goods.	Conditions.	—	Miles.	
				10.	20.
	AGRICULTURAL PRODUCE.			*s. d.*	*s. d.*
N. S. Wales {	Grain of all kinds, flour, and potatoes	"Up" journey; minimum 6 tons	per ton	1 3	2 —
		"Down" journey	,,	2 5	3 6
Victoria .... {	Grain of all kinds (except potatoes)	Minimum 6 tons {	,,	2 —	2 6
	Potatoes only		,,	1 3	2 —
S. Australia {	Agricultural produce ...	,, 3 ,,	,,	3 —	5 —
	Grain of all kinds	,, 3 ,,	,,	1 6	2 11
Queensland {	,, and potatoes	,, 1 ,,	,,	2 6*	3 9*
	Flour, bran, pollard	In truck loads for shipment	,,	1 3	2 1
N. Zealand {	Grain of all kinds, flour, and potatoes	Minimum 1½ tons	,,	3 5	4 6
	HAY, STRAW, CHAFF.				
N. S. Wales....	—	Minimum 6 tons	,,	1 8	1 11
Victoria	—	,, 5 ,,	,,	2 6	3 —
	—	,,		1 4	2 7
S. Australia {	Hydraulic or steam pressed	,, 5½ tons, broad gauge	,, {	—	—
		Minimum 4½ tons, narrow gauge		—	—
N. Zealand	—	—	—	—	—
	FRUIT.				
N. S. Wales....	Fresh, packed	—	per ton	2 —	2 11
Victoria	,, ,, in cases	—	,,	2 9	3 11
S. Australia....	,,	3 tons	,,	2 —	3 4
Queensland....	,,	Minimum 1 ton	,,	2 6	3 9*
N. Zealand	,,	—	,,	5 2	6 9
	DAIRY PRODUCE.				
N. S. Wales {	Dairy produce, butter, eggs, cream, &c.	Minimum 1 ton	,,	2 2	3 10
Victoria .... {	Dairy produce (not otherwise specified)	Actual weight	,,	3 10	7 2
	Dairy produce, butter....	Minimum 10 cwt.	,,	3 10	6 8
S. Australia {	Dairy produce (not otherwise specified)	,, 3 tons	,,	3 —	5 —
Queensland {	Dairy produce, butter, eggs, cheese, &c.	1 ton	,,	2 6	3 9*
N. Zealand	Butter, packed	Minimum 10 cwt.	,,	5 10	9 2
	MEAT.				
N. S. Wales {	Fresh	Minimum 4 tons	,,	2 6	3 1½
	Frozen	,, 12 ,,	,,	—	—
Victoria .... {	Fresh	,, 5 ,,	,,	2 9	3 11
	Frozen	,, 8 ,,	,,	—	—
S. Australia....	Fresh	,, 3 ,,	,,	3 —	5 —
Queensland {	,,	—	,,	3 —	5 6
	Frozen	Minimum 6 tons	,,	—	—
N. Zealand	Fresh	—	,,	6 5	10 7

* A rebate of 20 per cent.

Items of Goods Carried.   Year 1896.

	Miles.									
	30.	40.	50.	75.	100.	150.	200.	300.	400.	500.
	s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
	3 -	3 11	- 4 9	- 6 9	- 8 -	- 9 8	-11 4	- 12 4	- 13 4	- 14 -
	4 9	6 -	- 7 2	-10 4	- 13 -	-18 -	1 2 5	1 9 -	1 15 7	2 2 2
	3 6	5 -	- 5 6	- 7 6	- 9 4	-12 4	-16 4	- 19 -	1 1 1	—
	2 9	3 6	- 4 3	- 6 3	- 8 4	-11 8	-15 -	1 1 8	1 8 4	—
	7 4	9 5	-11 6	-15 8	- 19 10	1 7 1	1 14 5	2 9 -	3 3 7	3 18 2
	4 3	5 6	- 6 9	- 8 10	- 10 11	-14 1	-16 2	1 - 4	1 4 6	1 8 8
	5 -	6 3	- 7 6	-10 8	- 13 9	-17 11	1 2 1	1 8 4	1 14 7	2 - 10
	2 11	3 9	- 4 7	- 6 8	- 8 9	-11 11	-15 -	- 19 2	1 3 4	1 7 6
	6 2	7 10	- 8 8	-10 7	- 11 7	-13 8	-15 7	- 19 8	1 3 10	1 8 -
	2 7	3 2	- 3 10	- 4 4	- 4 8	- 6 6	- 8 1	- 9 9	- 11 2	- 12 6
	4 -	5 -	- 5 6	- 8 -	- 10 6	-15 -	-17 -	- 19 1	1 1 2	—
	3 10	4 11	- 6 1	- 7 11	- 9 10	-12 8	-14 7	- 18 3	1 2 -	1 5 9
	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—	—	—
	3 11	5 -	- 6 -	- 8 7	- 10 10	-15 -	-18 8	1 4 2	1 9 8	1 15 2
	5 6	6 8	- 8 3	-11 7	- 14 11	-19 6	1 4 1	1 10 11	1 17 10	—
	4 10	6 1	- 7 4	- 9 5	- 11 6	-14 7	-17 9	1 4 -	1 10 3	1 16 6
	5 -	6 3	- 7 6	-10 8	- 13 9	-17 11	1 2 1	1 8 4	1 14 7	2 - 10
	9 3	11 9	-13 -	-15 11	- 17 5	1 - 6	1 3 5	1 9 6	1 15 9	2 2 -
	5 6	7 2	- 8 10	-13 -	- 17 2	1 4 8	1 11 4	2 1 4	2 11 4	3 1 4
	11 -	14 11	-18 2	1 7 6	1 16 11	2 15 -	3 8 9	4 11 8	5 10 -	—
	9 5	12 2	-14 11	1 2 -	1 8 8	2 2 5	2 11 7	3 5 4	3 14 6	—
	7 4	9 5	-11 6	-15 8	- 19 10	1 7 1	1 14 5	2 9 -	3 3 7	3 18 2
	5 -	6 3	- 7 6	-10 8	- 13 9	-17 11	1 2 1	1 8 4	1 14 7	2 - 10
	12 5	14 11	-17 5	1 3 2	1 6 6	1 12 9	1 16 6	2 4 10	2 13 2	3 1 6
	3 9	5 7½	- 6 10½	- 9 4½	- 12 5	-16 10½	1 2 1	1 12 6	2 2 11	2 13 4
	—	—	—	—	—	-18 9	1 3 11	1 14 4	2 4 9	2 15 2
	5 6	6 8	- 8 3	-11 7	- 14 11	-19 6	1 4 1	1 10 11	1 17 10	—
	4 1½	4 4½	- 5 6	- 8 2½	- 10 11	-16 5	1 1 10½	1 12 10	2 3 9	—
	7 4	9 5	-11 6	-15 8	- 19 10	1 7 1	1 14 5	2 9 -	3 3 7	3 18 2
	8 -	10 6	-13 -	-18 3	1 3 5	1 11 9	2 - 1	2 12 7	3 5 1	3 17 7
	—	—	—	—	1 - 10	1 9 2	1 17 6	2 5 10	2 14 2	3 2 6
	14 6	18 7	1 2 11	1 9 8	1 13 7	2 - 1	2 3 10	2 12 2	3 - 6	3 8 10

allowed on these rates.

TABLE II *Contd.—Railway Rates for the Principa[l]*

Colony.	Class of Goods.	Conditions.	—	Miles. 10.	Miles. 20.
	COAL.			£ s. d.	£ s. d.
N. S. Wales	For home consumption	Minimum 6 tons	per ton	- 1 3	- 2 1
	„ shipment	In Commrs.' wagons.... } including cost of shipping	„	—	—
		In owners' wagons....	„ {	1. 10. -/6 -/11 }	- 1 3
Victoria	brown coal, lignite and coke	Minimum 6 tons	„	- 1 3	- 2 -
S. Australia	—	„ 3 „	„	- 2 -	- 3 4
Queensland	—		„	- 1 3	- 2 1
N. Zealand	Native brown coal .... „ anthracite or bituminous	Minimum 4 tons {	„	- 1 9	- 2 9
			„	- 2 6	- 3 8
	TIMBER.				
N. S. Wales	Logs, mining props, piles and girders	Minimum 6 tons	„	- 1 3	- 2 1
Victoria	Logs, piles, hardwood, &c.	„ 6 „	„	—	—
	Mining props, slabs, &c.	„ 7 „	„	- 2 -	- 2 6
S. Australia	S. Australian grown.... Logs, piles, girders, hardwood (imported)	„ 3 „ {	„	- 2 -	- 3 4
			„	- 5 -	- 7 -
Queensland	Logs, piles, girders, hardwood	—	„	- 2 6	- 3 9
N. Zealand	Native grown	—	100 sup. ft.	- - 8	- 1 4
	Imported	—	„	- 1 -	- 2 -
	WOOL.				
N. S. Wales	Greasy	—	per ton	—	
	Scoured	—	„	15. 21. 26.	
Victoria	—	—	„	- 5 - - 7 - - 8 6	
S. Australia	Greasy	—	„	- 5 -	- 7 -
	Scoured	—	„	- 6 6	- 9 6
N. Zealand	Undumped	In bales of 4 cwt.	„	- 5 -	- 9 7
	LIVE STOCK.				
N. S. Wales	—	In truck loads	per truck	- 15 -	- 15 -
Victoria	Full rate	„ „ {	„	1 - -	1 - -
	Store rate		„	- 15 6	- 15 6
	Sheep only, off-day rate		„	- 18 2	- 18 2
	„ „ goodstruck rate		„	- 10 -	- 10 6
S. Australia	Cattle or horses	„ „ {	„	- 10 -	- 10 -
	Sheep		„	- 10 -	- 11 8
Queensland	Cattle (except northern line)	„ „ containing 6 cattle or horses	„	- 5 -	- 9 -
	Sheep (except central railway)	In truck loads, containing 70 sheep	„	- 7 -	- 11 -
N. Zealand	Cattle or sheep	In truck loads, containing 6 fat cattle or 50 to 60 fat sheep	„	- 15 -	- 15 -
	ORES.				
N. S. Wales	Ores under 50l. per ton in value	Minimum 6 tons	per ton	- 1 3	- 2 1
Victoria	Copper, lead, tin, ores, clays, &c.	„ 2 „	„	- 2 9	- 3 11
S. Australia	Copper, lead, silver, &c.	„ 5 „	„	- 1 6	- 2 -
Queensland	—		—	- 1 3	- 2 1
N. Zealand	—	Minimum 4 tons	—	- 1 9	- 2 9

Special local rates to specified stations are not shown in the above table.

Items of Goods Carried. Year 1896.

Miles.									
30. £ s. d.	**40.** £ s. d.	**50.** £ s. d.	**75.** £ s. d.	**100.** £ s. d.	**150.** £ s. d.	**200.** £ s. d.	**300.** £ s. d.	**400.** £ s. d.	**500.** £ s. d.
– 3 1	– 4 –	– 4 10	– 6 3	– 8 2	– 11 –	– 13 1	– 16 11	1 – 1	1 3 1
– 2 –	– 2 6	– 3 –	—	—	—	—	—	—	—
– 1 8	– 2 1	– 2 8	—	—	—	—	—	—	—
– 2 9	– 3 6	– 4 3	– 6 3	– 8 4	– 11 8	– 15 –	1 1 8	1 8 4	—
– 4 10	– 6 1	– 7 4	– 9 5	– 11 6	– 14 7	– 17 9	1 4 –	1 10 3	1 16 6
– 2 11	– 3 9	– 4 7	– 6 8	– 8 9	– 11 11	– 15 –	– 19 2	1 3 4	1 7 6
– 3 9	– 4 7	– 5 5	– 6 11	– 7 11	– 10 –	– 12 1	– 16 3	1 0 5	1 4 7
– 5 –	– 6 4	– 7 8	– 9 4	– 10 2	– 11 10	– 14 2	– 19 3	1 4 3	1 9 3
– 3 1	– 4 –	– 4 10	– 6 3	– 8 2	– 11 –	– 13 1	– 16 11	1 – 1	1 3 1
—	– 4 –	– 5 –	– 7 6	– 10 –	– 15 –	1 – –	1 10 –	2 – –	—
– 3 –	– 3 6	– 4 3	– 6 3	– 8 4	– 11 8	– 15 –	1 1 8	1 8 4	—
– 4 10	– 6 1	– 7 4	– 9 5	– 11 6	– 14 7	– 17 9	1 4 –	1 10 3	1 16 6
– 9 6	– 12 –	– 14 6	1 – 9	1 7 –	1 18 6	2 9 11	3 8 8	4 3 3	4 17 10
– 5 –	– 6 3	– 7 6	– 10 8	– 13 9	– 17 11	1 2 11	1 8 4	1 14 7	2 – 10
– 1 8	– 1 11	– 2 2	– 2 11	– 3 2	– 3 8	– 4 2	– 6 –	– 8 1	– 10 2
– 2 6	– 2 11	– 3 3	– 4 5	– 4 9	– 5 6	– 6 3	– 9 –	– 12 1	– 15 3

Special distances:

```
        36.                   78.     97.     105.     120.     150.     204.     249.     301.     406.    504.
      – 11 4                  1 5 3   1 11 8   1 13 11  1 17 10  2 5 5    2 18 –   3 4 7    3 12 2   4 – –   4 – –
      – 14 7                  1 12 6  2 – 10   2 3 9    2 8 11   2 18 11  3 14 11  4 4 4    4 15 1   5 – –   5 – –
                                               101.              196.     245.     295.
            – 13 6   – 16 6   1 4 6   116 & 1 13 –      2 8 6    2 – –    2 19 –
```

30	40	50	75	100	150	200	300	400	500
– 9 6	– 12 –	– 14 6	1 – 9	1 7 –	1 18 6	2 9 11	3 8 8	4 3 3	4 17 10
– 13 3	– 17 –	1 – 9	1 10 2	1 19 6	2 16 9	3 13 11	5 2 –	6 3 11	7 5 9
– 14 7	– 19 2	1 3 4	1 11 3	1 17 1	2 2 1	2 7 1	2 17 11	3 8 4	3 18 9
1 – –	1 6 8	1 13 4	2 10 –	3 3 4	4 2 1	4 18 9	6 7 11	7 17 1	9 6 3
1 3 6	1 10 6	1 18 –	2 15 6	3 13 6	4 6 –	5 13 –	8 8 6	11 4 –	—
– 18 1	1 3 4	1 9 –	2 2 1	2 15 7	3 5 –	4 5 3	6 6 10	8 8 6	—
1 1 4	1 7 8	1 14 5	2 10 2	3 6 4	3 17 7	5 1 11	7 11 10	10 1 10	—
– 15 6	1 – –	1 5 –	1 17 –	2 8 6	3 1 –	4 – 6	6 – –	7 19 6	—
– 17 6	1 3 4	1 9 2	2 1 8	2 14 2	3 15 –	4 11 8	5 16 8	7 1 8	8 6 8
– 13 –	– 16 6	1 – 6	1 10 6	2 – –	2 16 6	3 13 6	5 1 –	6 3 6	7 5 6
– 14 6	– 18 6	1 2 –	1 11 6	2 1 –	2 15 6	3 10 –	4 11 –	5 7 6	6 4 –
1 – –	1 5 –	1 10 –	2 1 8	2 10 –	3 2 6	3 13 9	4 18 9	6 3 9	7 8 9
– 3 1	– 4 –	– 4 10	– 6 3	– 8 2	– 11 –	– 13 1	– 16 11	1 – 1	1 3 1
– 5 6	– 6 8	– 8 3	– 11 7	– 14 11	– 19 6	1 4 1	1 10 11	1 17 10	—
– 2 6	– 3 4	– 4 2	– 5 9	– 7 4	– 9 11	– 12 6	– 17 9	1 2 11	1 8 2
– 2 11	– 3 9	– 4 7	– 6 8	– 8 9	– 11 11	– 15 –	– 19 2	1 3 4	1 7 6
– 3 9	– 4 7	– 5 5	– 6 11	– 7 11	– 10 –	– 12 1	– 16 3	1 – 5	1 4 7

The rates quoted for South Australia are those for February, 1897.

TABLE III.—*Victorian Railways.*

Loan Act.			Loans Issued for Railways.	Net Amount Realised.	Rate.	Interest for Year.
			£	£	Per cnt.	£
42 Vict., No. 608............			4,156,574	—	4½	—
36	,,	439............	88,873	—	4	—
37	,,	468............	1,450,000	—	4	—
39	,,	531............	1,396,693	—	4	—
45	,,	717............	2,769,036	—	4	—
46	,,	739............	2,000,000	—	4	.—
46	,,	741............	107,600	—	4	—
47	,,	760............	3,758,788	—	4	—
48	,,	805............	3,251,172	—	4	—
49	,,	845............	4,500,000	—	4	—
51	,,	963............	130,000	—	4	—
53	,,	1,015............	500,000	—	4	—
57	,,	1,341............	150,000	—	4	—
56	,,	1,287............	2,107,000	—	4	—
56	,,	1,296............	464,672	—	4	—
58	,,	1,369............	153,900	—	4	—
52	,,	989	2,673,913	—	3½	—
53	,,	1,032............	3,150,000	.—	3½	—
54	,,	1,196............	2,226,087	—	3½	—
55	,,	1,217............	1,666,667	—	3½	—
42	,,	617............	31,900	—	5	—
Total.....................			36,732,845	36,184,148	—	1,459,743*

* Including expenses in payment of interest.

TABLE IV.—*South Australian Railways.*

Number.	Year Issued.	Loans Issued for Railways.	Net Amount Realised. Railway Loans.	Rate.	Finally Paid-off by Treasury.	Interest for Year on Outstanding Loans.
		£	£	Per cnt.	£	£
18	1853...............	150,000	150,000	6		—
18	'54............. .	250,000	250,000	6	504,100	
27	'55–56	36,000	36,000	6		
9	'57–58	68,100	73,000	6		
10	'57–58	76,800	80,000	6	76,800	—
2	'58.............	36,800	40,000	6	36,800	—
20	'59.............	12,600	13,500	6	12,600	—
2	'60.............	33,500	35,350	6	33,500	—
23	'62.............	12,800	14,000	6	12,800	—
1	'66–67	45,300	48,000	6	45,300	—
15	'66–67	18,600	20,000	6	18,600	—
25	'66–67	73,400	77,000	6	21,100	—
28	'66–67	500,000	533,252	6	120,000	—
25	'72.............	160,000	147,918	4	—	—
2	'74.............	450,000	403,567	4	—	—
18	'74.............	82,000	76,238	4	—	—
24	'75.............	200,000	188,077	4	—	---
47	'76........... ...	2,188,500	2,053,983	4	—	—
57	'76.............	65,418	58,005	4	—	—
77	'77.............	416,641	387,288	4	—	—
129	'78......	1,800,186	1,673,358	4	—	—
159	'79.............	234,830	234,830	4	—	—
189	'80.............	88,300	88,300	4	—	—
227	'81.............	631,594	630,073	4	—	—
272	'82.............	1,071,600	1,055,044	4	—	—
297	'84.............	635,000	633,234	4	—	—
334	'84.............	1,060,400	1,053,283	4	—	—
362	'85.............	553,900	545,127	4	—	—
391	'86........	17,000	17,000	4	—	—
449	'88.............	354,569	348,155	3½	—	—
491	'90.............	817,620	756,045	3½	—	—
549	'92.............	245,016	237,210	3½	—	—
553	'92.............	238,714	238,598	4, 11, 3	—	—
611	'94.............	100,470	96,600	3	—	—
		12,725,658	12,292,035	—	—	—
	Less, transferred to other undertakings	259,865	259,865	—	—	—
	Total	12,465,793	12,032,170	—	881,600	468,375

TABLE V.—*Queensland Railways. Statement showing Total Loans Issued; Railway Proportion of same; Net Amount Realised; Rate and Amount of Interest.*

[Compiled from particulars kindly supplied by the Under Secretary to the Treasury.]

Year Issued.	Total Loans Issued.	Loans Issued for Railways.	Net Amount Realised, Railway Proportion.	Interest.	
				Rate.	Annual Amount.
	£	£	£	Per cent.	£
1872...............	1,466,500	686,000	601,982	4	—
'75.........	1,695,300	766,600	694,561	4	—
'76......	740,700	126,100	113,729	4	—
'77	1,322,000	751,600	689,367	4	—
'78...............	1,184,800	820,000	723,748	4	—
'79...............	3,053,000	2,024,100	1,883,566	4	—
'81...............	1,089,500	336,400	321,985	4	—
'82	2,643,500	1,822,000	1,759,440	4	---
'84	1,439,000	847,000	826,167	4	—
'84 No. 2....	6,750,000	4,677,967	4,567,014	4	—
'84 ,,	3,230,000	2,239,033	2,104,055	3½	—
'89...............	1,554,834	931,834	895,056	3½	—
'90...............	3,704,800	2,256,450	1,969,933	3½	—
'94...............	2,000,000	346,568	345,567	3½	—
Total	—	18,631,652	17,496,170	—	711,203

TABLE VI.— *West Australia Railways.*

[Compiled from particulars kindly supplied by the Under Secretary for Railways and Works.]

Year Issued.	—	Loans Issued for Railways. (Proportion.)	Net Amount Realised for Railways.	Interest.	
				Rate.	Annual Amount.
		£	£	Per cent.	£
1872...............	—	1,675	1,675	6	—
'73...............	—	89,000	88,061	5	—
'75...............	---	26,060	26,000	5	—
'78...............	—	141,751	137,144	4½	—
'81...............	—	100,047	97,046	4	—
'82.........	—	200,557	194,139	4	—
'84...............	—	272,586	264,000	4	—
'88...............	---	4,841	5,233	4	—
'91...............	—	908,284	891,754	4	—
'93......	—	364,191	371,475	4	—
'94...............	—	90,246	90,941	4	—
Total		2,199,238	2,167,468	—	89,862

RELATION OF NET EARNINGS TO CAPITAL.

YEAR. 1870 1871 1872 1873 1874 1875 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894 1895 1896

Scale for Net Earnings. £.

Scale for Capital. £.

1,300,000

1,200,000

40,000,000

1,100,000

1,000,000

900,000

30,000,000

Base line of New South Wales.   Year 1888.

800,000

700,000

600,000

20,000,000

500,000

VICTORIA

SOUTH WALES

400,000

NEW

300,000

10,000,000

200,000

SOUTH AUSTRALIA

100,000

0

0

CAPITAL...............................THICK LINES.

NET EARNINGS......................THIN LINES.

Plate II.

RELATION OF EXPENDITURE TO REVENUE.

YEAR.

| Scale for Gross Earnings. | | Scale for Working Expenses. |

GROSS EARNINGS........THICK LINES.
WORKING EXPENSES........THIN LINES.

To preserve the comparison, the half years of the following have been doubled, viz:—
(Vic.) 1871 & 1884.   (S.A.) 1878.   (Q.) 1889.

Plate III.

YEAR 1896.

RELATIVE VARIATION OF WORKING EXPENSES & NET EARNINGS

IN PROPORTION TO

GROSS EARNINGS.

PER-CENT OF GROSS EARNINGS.

Plate IV.

YEAR 1896.

RELATIVE VARIATION OF WORKING EXPENSES & NET EARNINGS

IN PROPORTION TO

TRAIN MILES.

COST IN PENCE PER TRAIN MILE.

Plate V.

AGRICULTURAL PRODUCE.

HAY, STRAW & CHAFF. &c.

FRUIT.

Plate VI.

DAIRY PRODUCE.

TIMBER.

HARRISON & SONS, LITH. ST MARTINS LANE.W.C.

Plate VII

COAL.

Rate per ton.

MILES.

$^{s}/_{D}$										
35/-										
30/-										
25/-										
20/-										
15/-										
10/-										
5/-										
0										

10 20 30 40 50   75   100   150   200   300   400   500

SOUTH AUSTRALIA

VICTORIA

QUEENSLAND

NEW SOUTH WALES

NEW ZEALAND

ORES.

$^{s}/_{D}$										
40/-										
35/-										
30/-										
25/-										
20/-										
15/-										
10/-										
5/-										
0										

VICTORIA

QUEENSLAND

SOUTH AUSTRALIA

NEW SOUTH WALES

NEW ZEALAND

Plate VIII.

LIVE STOCK.

Rate per truck

MILES.

£

9

8

7

6

5

4

3

2

1

0

NEW SOUTH WALES Store rate.

SOUTH VICTORIA Goods truck rate AUSTRALIA

VICTORIA NEW ZEALAND

Rate per ton.

MEAT.

£
10

9

8

7

6

5

4

3

2

1

0

NEW ZEALAND

AUSTRALIA

SOUTH

VICTORIA

NEW SOUTH WALES

Plate IX

WOOL.

HARRISON & SONS, LITH. ST MARTINS LANE W.C.

Plate X.

PROFILE OF GRADIENTS. ADELAIDE TO BRISBANE.

SOUTH AUSTRALIAN RY
ADELAIDE TO SERVICETON.

VICTORIAN RY
SERVICETON TO MELBOURNE.

VICTORIAN RY
MELBOURNE TO ALBURY.

NEW SOUTH WALES RY
ALBURY TO SYDNEY.

NEW SOUTH WALES RY
SYDNEY TO JENNINGS.

QUEENSLAND RY
JENNINGS TO BRISBANE.

DISCUSSION *on* MR. PRICE HOWELL'S PAPER.

MR. H. MONCREIFF PAUL said he could have wished that
Mr. Howell had been present to read his own paper, as there was
always a little delicacy in discussing a paper in the absence of the
writer. This paper was full of interest, and worthy of much
study, though perhaps it would have been better if, at the
conclusion, the author had been able to make some sort of
summary and let his readers know what results he had arrived
at from the statistics he had so exhaustively worked out. There
could be no doubt as to the importance of Australian railways.
In a new country facility of transit was essential, not only for
people, but much more for the products of the country, otherwise
many so termed by-products would certainly lie waste, because
they could not be economically transported to market. They were
also the means of connecting various colonies together for strategic
and other purposes. These Australasian colonies had manifestly
not co-operated in the matter of railway construction. Some had
gone ahead of others in the matter of construction of lines of
railway and development of country. There was an additional
reason why railway construction should be developed in those
colonies in view of the desire now so generally expressed for
intercolonial federation. For strategic purposes therefore it was
most desirable that the main lines of Australian railways east and
west and north and south should be developed as quickly as possible.
That meant that colonies would be connected together, and in
point of fact, that railway connection would pave the way for
complete federation later on. The absence of a combined plan in
the design of their railways was manifest from the want of
uniformity in gauge, which ran from 5 feet 3 inches to 3 feet
6 inches. This was detrimental, because one could not travel from
west to east without changing carriages. With regard to going
from north to south that difficulty had to a certain extent been
obviated, but much still remained to be done before the railway
system throughout these colonies, setting aside New Zealand and
Tasmania, would be what it ought to be. One could certainly
travel from Adelaide to Melbourne without change of carriage on
an uniform gauge of 5 feet 3 inches, but when one went from
Melbourne to Sydney there was a break of gauge at Albury, which
for military purposes would be a serious disadvantage. He fancied
that heavy lines had been laid down in certain places where lighter
lines would have sufficed, and hence a greater cost in construction
had been incurred than was necessary. But of course it was easy
to be wise after the event. Examining the cost per mile of rail-
ways in Australasia as a whole, including Tasmania and New
Zealand, it was 9,617*l.*, New South Wales standing at 14,157*l.* and
Victoria at 12,317*l.* per mile, and those two colonies represented the

I 2

largest portion of the existing railway system. If one looked to other countries in a somewhat similar position, one found that in Argentina the cost was 10,632*l.*, and in Canada 11,522*l.* per mile. But the salient feature in connection with Australasian railways was that they were not self-supporting. The gross earnings for 1896-97 might be taken in round numbers over the colonies at 10,200,000*l.*, while the working expenses were say 6,000,000*l.*, leaving the net earnings 4,200,000*l.* Now the money which had been borrowed and applied to the making of railways in those colonies might be taken in round numbers at 135,000,000*l.*, and the rate of interest payable upon it at approximately 4 per cent. The returns of the railways were but $3\frac{1}{4}$ per cent., and therefore there was an annual average loss of $\frac{3}{4}$ per cent. on the capital expended. So that the theory held by the various Governments that their railways should be self-supporting had not been carried out. There was a further difficulty in connection with these railways. The statistics of New South Wales and Victoria in the Commissioners' report on railways, showed that there was spent on the construction of non-paying branches in Victoria 14,000,000*l.*, and in New South Wales 8,500,000*l.*; the revenue of these branches being respectively 529,500*l.* and 313,800*l.*, whilst their working expenses were 363,700*l.* and 275,000*l.* The annual interest payable by the former was 515,000*l.*, and by the latter 338,800*l.* leaving a net loss in the former case of 349,200*l.*, and in the latter of 300,000*l.* Lines were sometimes built at public expense for the benefit practically of local landowners and speculators, who, in order to enhance the value of their property through the medium of powerful friends, and by the exertion of special influences, succeeded in securing the development of railway lines over the lands owned by them. Such lines being constructed in districts where the traffic was inadequate, did not pay, and the finances of the colonies in consequence suffered. The plan originally adopted should have been to take care of your trunk lines first, and leave the branches till later on. It must not be forgotten that the cost of construction of railways depended very much upon the time at which the work was executed, because the cost of materials and of labour varied. When the Australasian colonies in past years got their money very easily from John Bull, that money was at once sunk in railway plant and construction without regard to the market conditions prevailing at the time. Wiser counsels had prevailed of late years, and the cost in Western Australia was very much less per mile than in the other colonies he had mentioned. In one part of the paper it was remarked that Victoria carried a good deal of New South Wales' produce, taking it to Melbourne instead of to Sydney. This was not due solely to the proximity of the former to the Murray River, as stated by Mr. Howell. On this point a little more explanation should be given. There was a certain portion of New South Wales situated to the north of the Murray, and called Riverina. This district might be said to be one of the best jewels in her crown, but it was very much developed by Victorian men, who, from some change in the Victorian land laws thirty-five to forty years ago, were, so to say, driven across the

Murray and so developed Riverina. Their purse-strings were, however, held in Victoria, and therefore their produce went thither. Victoria at that time had tapped the Murray River by two railway systems to the north at Echuca, and to the north-east at Albury. Consequently those Victorians who went to live in Riverina had the opportunity of carting their wool to the Murray at Echuca and Albury, whence it was carried by the Victorian railways to Melbourne for sale or shipment. It was some time before New South Wales awoke to this fact, and she then found that a great deal of the traffic which might have been attracted to Sydney was diverted to Melbourne. The former has found it to be very difficult to regain the trade thus lost, and although the difference in mileage between Riverina and Sydney and Riverina and Melbourne was inconsiderable, Victoria, being first in the field with her railways, has, as regards Riverina, continued to reap the benefit of her diligence.

Mr. W. M. ACWORTH said there was one thing for which they might all be grateful to the Australian colonies, and that was the excellence of the statistics that the colonial railways gave, as compared with the exceedingly jejune materials for knowing what their railways did which they had in England. Of course there was a good deal more one would like to get. Some of the railways gave ton-mile statistics, and others did not, and it was almost impossible to compare one line with another without these figures. But at least all the different colonies published graphic statistics, showing year by year the increase or decrease in each individual important class of traffic; first and second class passenger traffic, wool traffic, hay, straw, and so forth, which brought out the facts in a way that they never got in this country. The last speaker referred to the question of gauge, and he wished the paper had mentioned how that question stood at the present moment. He noticed in a recent report of New South Wales, that the Railway Commissioners of that colony had hopes of getting a uniform gauge all over Australia in the near future. Of course if there were a uniform gauge it would be that of New South Wales, so perhaps they were naturally a little sanguine upon the subject. Another point on which he wished something had been said, as it was more important than any other to the English people, was the method of management. Of course it was not strictly statistical, but it would not have been foreign to the scope of the paper if they had had some account of the comparative success or failure of the different attempts that the Australian railways had made to keep the politicians, so to speak, at arm's length. It always seemed to him that the amount of independent power that the Commissioners were allowed, and the extent and methods of the limitations enforced or attempted to restrain or prevent the day-to-day interference by members of the Legislature for *political ends* with railway management, was the most interesting thing in connection with the Australian railways. It interested him very much to read the passage in which the author said he could not fail to recognise the efficient manner in which

the colonial railways were conducted. No one would wish to
challenge that statement put in that broad shape; and he quite
agreed with Mr. Price Howell that it was impossible to compare
Australian railways with the railways of the United States as a
whole, but he thought it would be very interesting, and not with-
out value, to compare the Australian railways with a group of
railways in the United States with which they were fairly
comparable. He would take the group of railways which were
classed in "Poore's Manual" as the south-western group,
including the States of Missouri, Arkansas, Texas, Kansas, Colo-
rado, New Mexico, and the Indian and Oklahoma territories, roughly
speaking, the country west of the Missouri and south of Denver,
down to the Mexican frontier, but excluding California. As far
as one could judge, that district was fairly comparable in various
ways with Australia. There was a very sparse population, for
there was only one town in it at all as important as either
Melbourne or Sydney, namely, St. Louis, which was situated on
the eastern border of the district, and had a population of about
70,000. Now he found that Australia had 12,000 miles of rail-
ways, whilst this district, with a pastoral population and an area
of only three-quarters of a million of square miles, as against four
times that in Australia, had 35,000 miles. Roughly, the population
was about the same, five millions in America as against four and a
quarter millions in Australia. Yet there was three times the rail-
way mileage in America. With regard to the relative economy with
which the lines were constructed, the Australian lines were more
than half narrow gauge and yet cost 9,500*l.* a mile; whereas the
lines in the Texas and Kansas district had cost nominally 11,000*l.*
a mile, but were all normal gauge. But this 11,000*l.* a mile was
only the nominal capital. It was generally admitted that the half
of the capital, which was represented by bonds, say, 6,000*l.* a mile,
was quite as much as those lines actually did cost to construct.
So that the Australian railways did not seem to show that economy
in construction cost which might naturally have been expected to
result from their money being raised on the credit of the Government.
It might be thought that the construction of the American lines
had been much less substantial. But that these railways had
been fairly efficiently constructed seemed to be vouched by the
fact that they had proved capable of carrying a vastly greater
traffic than the Australasian lines. The Australasian lines carried
about ten million tons, while this group of American lines carried
forty millions, and of course there could be no question that the
distances carried in Kansas, Texas, and Colorado would be on the
average much greater, so that there was more than four times the
actual amount of work done. He had not the passenger figures,
but probably they would be considerably bigger in Australia,
because around Melbourne and Sydney there was a considerable
suburban traffic, which ran up the number of individual passen-
gers. The other point on which a comparison would be useful
was that of the rates. He thought there was no question that the
Americans carried a great deal cheaper than the Australians.
Some of the Australian figures quoted in the paper seemed extra-

ordinarily high judged by European standards. At any rate, the rates could not be claimed to be exceedingly low, whereas the rates in the American south-west group, considering that they were carrying for a comparatively sparse population, were exceedingly low. The average rate for passengers was 2·34 cents, or less than $1\frac{1}{4}d.$, which was probably lower, and the average freight rate was 1·15 cents, or a little over a halfpenny, which was undoubtedly much lower than the average rates of the Australian colonies. Of course no comparison went entirely on all fours, but on the whole the evidence seemed to him to indicate very distinctly that. granting the State railways of the Australian colonies to be efficiently conducted, the private railways of America must be vastly more efficiently conducted.

Mr. P. DE JERSEY GRUT said he should like to ask whether the last speaker had taken into account the net returns of interest on capital made by the group of American railways to which he referred, because that was a very important consideration. Many of the American railway companies practically went out of existence after a time; they went into the hands of a receiver, and the capital invested in them partly or wholly disappeared. A comparison could hardly be fairly made between them and Australasian railways, which were in the hands of Governments, and had to be carried on whether they paid or not, while the capital invested in them never disappeared from the debtor side of the national balance sheet. There was another point which he had never seen treated by writers on this side, in connection with one very important aspect of Australasian railways, and that was that there were in those countries enormous Crown estates. It was a case where the landlord, in fact, wished to improve his property, and it was most important that he should do so, because it increased not only its saleable value, but its rental. In the Australasian colonies the land revenue amounted to not much short of five millions sterling per annum, and they looked forward to its increasing with the increase in population. That was a most important aspect of the policy of the Governments in pushing forward railways, a policy the avowed object of which was to promote settlement by increasing the attractiveness of the land. The gentleman who first spoke alluded to the fact that a very considerable number of branch lines paid very badly; in some cases they did not pay their working expenses, and that unquestionably was a feature which suggested adverse criticism, but at the same time it must be considered from the point of view of public policy referred to. In Queensland, for example, they had about 428,000,000 acres, of which only about 14,000,000 had been sold. The vast proportion of the land was still Crown property, and it was of great importance to the community as a whole that that property should be improved and developed. They were content, at least to some extent, to make even a loss on their railway revenue, or at any rate that it should not cover the expenses and interest, provided that their land revenues not only made up for the deficiency but a great deal more. The proprietor of a

vast estate might be quite content to make a loss on his department of communications, provided that, through the facilities he afforded thereby, he made considerably greater profit on his rentals and sales, and laid the foundation for increased traffic. That was the most important aspect of the case, but it was not referred to in this country in criticisms on Australasian railways. Again, the net return, after paying expenses, came to about $3\frac{1}{4}$ per cent. on the capital expended. That was not a bad return, and he should be very glad to know whether the group of American railways which had been referred to returned $3\frac{1}{4}$ per cent., taking into account not only the companies at present existing, but also those whose capital had been swept into the abyss of insolvency. If all that capital were added to that which might be considered still to be live capital, he should very much doubt whether they returned $3\frac{1}{4}$ per cent. Although it was perfectly true that the net returns from these railways in Australasia was $3\frac{1}{4}$, and the rate of interest they paid on their loans was nearly 4 per cent., it should also be remembered that the borrowing rate they were paying was being continually reduced. During the last week three Australasian loans had been floated, chiefly for the purpose of paying off previous loans at a higher rate of interest, and these loans were obtained at a shade over 3 per cent., so that, in fact, a return of $3\frac{1}{4}$ per cent. from the railways more than paid the interest at rates at which they could now borrow, and although the average rate on the money borrowed over a considerable past period amounted to nearly 4 per cent., still, as those old borrowings matured and were replaced by loans at a lower rate, the railways could pay their interest. The Governments might also look forward, with an increase of population, to better returns from the working, so that in the future they would be in a much more satisfactory position than they had been in the past.

Sir JULAND DANVERS, K.C.S.I., said the first thing that struck him while hearing the paper read, was the want of uniformity in the various accounts rendered. This made the process of examination and comparison very difficult, and the writer, while giving much useful information and furnishing facts which were interesting, was unable to draw conclusions which would be as instructive as he could wish. This he frankly admitted in his paper, and it was to be regretted that the railways were not under the supervision of such a department as the Chairman (Sir Courtenay Boyle) represented. The unit necessary for statistical comparisons was that derived from the number of tons and passengers carried one mile, and their cost. It was to be hoped that Mr. Price Howell would use his influence to obtain such returns. If they were furnished by all the different railways, they would enable a judgment to be formed of the economy exercised in the management on various systems. Useful comparisons could thus be made between railways in Australia and with those in other countries. They would also furnish a safe guide for remunerative rates and fares. Average receipts per mile of line were of little use for these

purposes, but to know the average cost and receipts per ton of goods and passengers per mile was invaluable.

Mr. MATTHEW MACFIE said that, having been resident for five or six years in Australia, and having been at the head of one of the leading newspapers of Melbourne, he was brought considerably into contact with the political and economic bearings of the railway system of the Australasian colonies. He particularly admired not only the fulness and accuracy of the views expressed by Mr. Moncreiff Paul, who also had had the advantage of residence there. In one or two incisive remarks he seemed to hit the blot which affected the whole railway administration in that country. It was obvious from all that had been said in the paper and in the discussion, that the Australasian railways did not pay, taking them as a whole. He must say New South Wales seemed to be making progress, at present, in this department of the public service, probably in consequence of having had for some years a very efficient railway commissioner, who was entitled to a great deal of commendation for the manner in which he had performed his duties. No serious objection could be made to the manner in which the trunk lines had been constructed as a rule, whether as regards the route followed or the cost of construction. The great trial of the patience of the Australasian taxpayer was the making and unprofitable working of many of the branch lines. He was sorry to be obliged to say, as the result of his own observations, speaking as charitably as he could, that during his stay in Victoria, the making of branch lines in that colony was very largely influenced by political considerations. The course of events was generally this: The representatives in Parliament naturally desired to conciliate their constituents by conferring benefits upon them at the cost of the State, and usually the making of branch railways was one of the conditions upon which re-election of members of Parliament was guaranteed and the party in office kept in power. Influence was brought to bear on the Colonial Treasurer of Victoria, by parliamentary supporters of the Government, to grant the requests of their constituencies. When Mr. Gillies filled that office in 1892 he was perpetually embarrassed by the approaches of suburban members, and at last was brought to a stand before the House in consequence of the numerous demands made by rural representatives for branch lines. One night he astonished the House by saying that the appeals which had been made to him, within a few months, would bring the total new loans required to build the railways solicited up to 22,000,000*l.* Following upon this announcement he determined to take no further steps in the matter until a Committee of inquiry had been appointed by the House to go into the whole question. That Committee was appointed, and conducted its labours for a series of months. The result of the investigation was the discovery made by the Committee that a large number of railways had been made in the colony which could not by any possibility pay until most of the honourable gentlemen then in Parliament were in their graves. The money with which so

many unremunerative lines were constructed had been obtained between 1885 and 1889, when the colonies were in high credit in this country, and the local banks were overloaded with deposits on Government account—the proceeds of British loans—which were waiting to be employed in making these lines. Several local railways of the most superfluous character were made around Melbourne, apart from the rural districts, and that accounted to a very large extent for the preposterous deficiencies in the railway income from year to year ever since. No doubt, as had been stated, there had been, in recent years, a reduction in the rate of railway expenditure, but that by no means compensated for the extravagant outlay on the existing lines, and he was sorry to have to accentuate what Mr. Moncreiff Paul had said. One of the serious difficulties was the suddenly increased value of the land, when it leaked out that the Government had decided to make use of it for railway purposes. Members of Colonial Parliaments sometimes utilised the early knowledge they were able to obtain of the intentions of the Government to acquire lands which they knew would be required for railways. In one instance, which he had in his mind, a large fortune had been made in this way. The high rates which had to be paid for the lands, as well as the paucity of traffic in sparsely populated districts, largely accounted for the difficulty in making the railways pay. He thought the root of the evil with regard to the railway system in Australia was first of all that it was a Government system. That question had not been touched upon, but it was a very suggestive question, more particularly as there was a movement in this country in certain quarters for the transfer of railways to the Government. In his opinion it was a choice of evils, but he ventured to think that the methods pursued in the United States, with all the drawbacks of private ownerships of lines, would seem to afford a better guarantee, in the long run, for the healthful development of commercial facilities, than the placing the railways of the country in the hands of the Government. He was strongly of opinion that there was nothing better for a politician in this country, who wanted to know the dangerous tendencies of State socialism as affecting railway and other kinds of property, than to reside for a time in the Australasian colonies, where it was to be feared socialistic experiments were carried to excessive lengths.

The CHAIRMAN (Sir COURTENAY BOYLE, K.C.B.) said in estimating the application of figures to railways, as to any other form of commercial machinery, regard must be had to the object with which the railways were started. Not very long ago, not with regard to this country or to Australia, he asked a gentleman what he thought the objects of light railways were? The reply was, that the principal object was to take his goods over somebody else's land, at somebody else's expense, to somebody else's market. That, he imagined, was not the intention with which the railways were constructed in Australia, and certainly not in this country. He had been very much impressed by the observations of Mr. Grut and Mr. Macfie, who had pointed out that railways in Australasia

were constructed not merely with a view to an immediate financial return, but with the object of developing the colony, and that was an object which would commend itself to all concerned in the administration of those great colonies. It was to some extent the policy followed by our great railway companies in this country. They had not regarded solely the immediate return from a particular line they were desirous of constructing, but had also regard to its effect on the whole of their system. In the same way the Governments of the colonies in Australia did not consider the question simply with regard to the immediate pecuniary return, but were actuated by considerations affecting the development of the colony and the improvement of the means of communication. They might be quite sure that in the long run, if the railways were wisely constructed, returns must come from increase of population, and consequently of traffic. References had been made to the difficulties which the Governments had in constructing branch lines, but he could assure Mr. Macfie that our big railway companies in this country had suffered from very similar difficulties. It had leaked out where a railway was going to be constructed, and some kind friend often went and bought the land. It was not an exceptional case at all, the only difference was that in Australia the Government had to pay, because the Government owned the railway, and in this country the shareholders in the company had to pay. As a Government officer, he was very glad to hear what Mr. Macfie said about the State management of railways. He attached the greatest possible importance to the individual enterprise and the great knowledge and zeal with which the great companies of this country managed the railways. Perhaps he ought to say that if the Government managed them they would do it a great deal better; but he was not quite certain that he could substantiate that proposition. With regard to the methods on which the statistics had been compiled, Sir Juland Danvers and Mr. Acworth both showed that yearning that they all felt for the ton-mile. He had been yearning for it for the last fifteen years, and he supposed he would have to go on for some years longer. All the railway companies expressed their utter inability to give the ton-mile. They said that in England a large train carried articles of very different value for various distances; in the same train you might find lace and petroleum, pianos and matches. How were you to estimate the cost of conveying those various articles for a particular distance? That was the answer that always came when they asked for the ton-mile. He was sorry to hear that Mr. Acworth was still dissatisfied with the statistics the Board of Trade furnished for him, but when he said the figures in the paper were infinitely superior to those furnished for home consumption, he should like, without at all quarrelling with him, to point out that in one place they were told that in some of the colonies at least it was impossible to make a distinction between passengers and goods per train-mile. At any rate in England they gave the difference between passengers and goods trains. The figures, as far as they were quoted in the paper, showed that the lessons learned in Australia were the same as those learned here, namely, that there

was always a temptation to put upon the short distance traffic as much as that traffic would bear, and to take off from the long distance traffic as much as could be taken off. If the railway managers, whether Government officers or his friends of the London and North Western or Great Western Railways, did not adopt that principle they would find very great difficulty in getting any long distance traffic at all. Another thing he found running through the statistics was that the opening of new railways (if they were wisely conducted, and if the temptations Mr. Macfie had referred to were sternly resisted) always led to an ultimate development of traffic. The more you wisely increased railways, even in this thickly populated country, the more the traffic grew. More than that it had been proved over and over again that the greater the facilities the railways gave to the public the greater would the returns be. There were several other lessons to be drawn from the paper, but he would not detain the meeting any longer except to move a most cordial vote of thanks to the writer of the paper, which would be conveyed to him by the secretary.

MISCELLANEA.

CONTENTS:

I.—*On the Representation of Statistics by Mathematical Formulæ.*—
continued.[1]   (Part II.)   By Professor F. Y. Edgeworth,
M.A., D.C.L.

II. Among formulæ selected on *à priori* grounds to represent
statistics of frequency, about the origin and constitution of which
we have no special information, a very high place must be assigned
to Professor Pearson's method of separating a given set of observations into two (or more) normal groups.[2]   For it is founded on a
vera causa: we know, *à priori*, that such compounds exist.   For
instance, the statistics of the heights of males for all Italy may be
broken up into several slightly but really distinct types, corresponding to the different provinces.[3]   It is a probable hypothesis
that such mixture of types prevails widely in Natural History.
The character of elegance too attaches in a high degree to Professor

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[1] See *Journal of the Royal Statistical Society*, December, 1898.

[2] *Transactions of the Royal Society*, 1894 A, p. 71; described in the
Journal of the Royal Statistical Society, 1893, p. 677.

[3] In the *Atlante Statistico*, published under the direction of the Ministero di
Agricultura, &c., Rome, 1882 (to be seen in the library of the Royal Statistical
Society), the relations between the curves pertaining to the different provinces are
beautifully exhibited.   It appears from the theory of errors that the differences
between the means for different provinces are significant of real diversities in type.
Consider, for instance, the means for Piedmont, Lombardy, Venice, Emilia,
Tuscany, and Sicily respectively, each based on a number of observations between
100,000 and 200,000.   The *modulus* for the deviation of such an average from
the general average, which is based on more than a million observations, is less
than $\frac{1}{\sqrt{100,000}} \times$ *modulus* for one observation, less than ten centimetres ÷
315, < 0·031 centimetre, while the means, 0·01, 0·03, &c., of a metre (*loc. cit.*) are
often one and sometimes two centimetres apart.

Pearson's beautiful conception; and he has shown that it fits some facts marvellously.[4]

The method is attended with one disadvantage: it is very laborious. It requires that the *moments*, or mean powers of the observations about the centre of gravity up to the *fifth* inclusive should be computed, and that an equation of the *ninth* degree should be solved. The labour may sometimes be abridged by a tentative process.[5] Whereas the solution is made by Professor Pearson to depend on two variables, p_1 and p_2, respectively the sum and product of γ_1 and γ_2, the distances of the two subordinate centres from the centre of gravity of the compound system;[6] it may be possible to dispense with one of the simultaneous equations for p_1 and p_2—the one involving fifth moments—and substituting in the other trial values for one of the variables, to determine a system of the two which fits the observations.

The retained equation is of the form—

$$(3) \quad p_1^3 - \frac{2\mu_3}{p_2} p_1 - \frac{6p_2^3 - \lambda_4 p_2 + \mu_3^2}{2p_2^2} \quad [7]$$

where μ_3 is the mean cube of the deviations of the given observations from their centre of gravity; and $\lambda_4 = 9\mu_2^2 - 3\mu_4$, μ_2 and μ_4 being respectively the mean second and the mean fourth powers of the deviations. We have now to substitute different values of p_2 in this equation, and determine the corresponding values of p_1; then to test what system of values for p_1 and p_2 yields a suitable system of values for the constants of the component curves. These constants are thus derived from p_1 and p_2. By definition for the two distances of the respective centres, we have

$$(1) \quad \gamma_1 + \gamma_2 = p_1$$
$$(2) \quad \gamma_1\gamma_2 = p_2$$

And, as shown by Professor Pearson, the moduli of the respective curves, say c_1 and c_2, are given by the equations[8]—

$$(4) \quad \tfrac{1}{2}c_1^2 = \mu_2 + p_2 - \tfrac{1}{3}\frac{\mu_3}{\gamma_2} - \tfrac{1}{3}p_1\gamma_1$$

$$(5) \quad \tfrac{1}{2}c_2^2 = \mu_2 - p_2 - \tfrac{1}{3}\frac{\mu_3}{\gamma_1} - \tfrac{1}{3}p_1\gamma_2$$

Solutions which make these *square* quantities negative must of course be rejected.

The mixture of types is discussed by Dr. Livi in the *Annali di Statistica* (1883), vol. viii, p. 119 *et seq.* See also his *Saggio dei Resultati Antropometrici*, Roma, 1896.

[4] *Loc. cit.*, and cp. *Chances of Death*, by Karl Pearson.

[5] Here, and elsewhere, I have to acknowledge having received suggestions from Professor Pearson's path-breaking " Contributions." See *Transactions of the Royal Society*, 1895 A, p. 406, and *passim.*

[6] Interpreted rather as distance than mere "numens;" as by Professor Pearson himself at p. 88, *loc. cit.*

[7] Replacing p_3 by $p_1 \times p_2$ in Professor Pearson's equation (24), *Transactions of the Royal Society*, 1894 A, p. 84; and rearranging in the form of a quadratic equation for p_1.

[8] Professor Pearson's equations (18) and (19), *loc. cit.*, p. 83; his v_1 and v being replaced by the half-squares of our moduli.

The process of trying different values of p_2 is abridged by several limitations. First, *positive* values of p_2 may be excluded, for they correspond to "subtractive" solutions, according to which one component frequency is not superadded to, but deducted from, the other.[9] Another limitation is imposed by the condition that the solution of the quadratic for p_1 must not be *imaginary*. I suggest, as suitable to the present purpose, though not essential, the further condition that p_1 should be positive.[10]

We have now to select within the range which has been demarcated the value of p_2 which gives the best, or at any rate a good, solution. Here the question arises: What is a good solution? Upon what principle are we to select from an indefinite number of solutions all complying with the four conditions constituted by the first four mean powers? When Professor Pearson has to choose between two solutions, both satisfying the five conditions constituted by the first five mean powers, he suggests that preference should be given to the solution which affords the more accurate value of the mean *sixth* power.[11] Upon this principle we might take as our test for discriminating solutions the mean *fifth* power, which we have not utilised in our system of equations. But for the purpose here contemplated it seems hardly worth the trouble of finding an additional *moment*. An equally good criterion, I think, may be obtained from the more easily handled *percentiles*. Let us give the preference to that solution which gives the position of the *median* most accurately.
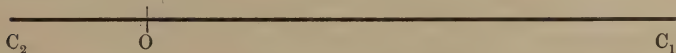
An example will make the method clearer:—

The barometric heights at Babbacombe, tabulated by Professor Pearson,[12] form a group of which the second, third, and fourth mean powers, as computed by him, are respectively—

$$\mu_2 = 10 \cdot 9012 \,; \quad \mu_3 = 13 \cdot 0321 \,; \quad \mu_4 = 397 \cdot 0938.$$

[9] Pearson, *loc. cit.*, p. 89.

[10] When, as in this inquiry, we are seeking not so much the true or most probable representation, as that which is possible and plausible, as belonging to a genus which is known to occur *in rerum naturâ*, then I think we may be justified in confining ourselves to the more easily conceived of the two constructions which correspond respectively to the positive and negative values of p_1. That is, I think, the former, where, as in the case before us, the mean cube is positive. For, O being the

centre of gravity, and C_1 C_2 the centres of the two component curves, if distances from O measured along the abscissa to the right are regarded as positive, it is easier to understand how the mean cube of deviation should be positive in the case when OC_1 is greater than OC_2 (and therefore p_1, the sum of the distances OC_1 and OC_2 with their proper signs positive) than in the opposite case. Not that the opposite case is impossible; as appears from the *second* solution of the illustration given by Professor Pearson in his first "Contribution" to the *Transactions of the Royal Society* (1894, p. 85); where though the odd powers (third and fifth) are negative, the value of p_1 (ibid., p. 89) may be positive.

[11] *Loc. cit.* p. 74.

[12] *Transactions of the Royal Society*, 1897 A, p. 434. *Ante (Journal of the Royal Statistical Society*, 1898), p. 685.

Whence $\lambda_4 \ (= 9\mu_2^2 - 3\mu_4) = -121.756$ nearly. Accordingly the quadratic for p_1 becomes

$$p_1^2 + 2p_1 \frac{13 \cdot 0321}{p_2} - \frac{3p_2^3 + 60 \cdot 878 p_2 + 84 \cdot 9178}{p_2^2} = 0$$

Only negative values of p_2 are admissible in this expression. A second limitation is imposed by the condition that the solution of the quadratic for p_1 must not be imaginary; whence

$$(13 \cdot 0321)^2 + (3p_2^3 + 60 \cdot 878 p_2 + 84 \cdot 9178) > 0$$

$$p_2^3 + 20 \cdot 2926' p_2 + 84 \cdot 9178 > 0$$

The limit at which this condition ceases to be true, as we diminish the value of p_2[13] is given by equating to zero the left hand member of the above written inequation.[14] This cubic equation has only one real root between -2.93 and -2.94. A further limitation is secured if we impose the condition that p_1 must be positive. Then, as we ascend from $p_2 = -2.93 \ldots$ towards zero, we must stop at the value of p_2 which makes the absolute term of the quadratic zero; or

$$3p_2^3 + 60 \cdot 8787 p_2 + 84 \cdot 9175 = 0$$

The only possible root of this equation is approximately -1.289. The field to be explored is thus narrowed to the tract of values between (a point above) -2.94 and (a point below) -1.289.[15]

Take, for example, as the value of p_2 a round number nearly intermediate between the extreme limits, namely, $p_2 = -2$. Then the quadratic for p_1 becomes approximately

$$p_1^2 - 6 \cdot 516 \ p_1 + 15 \cdot 209 = 0$$

Whence $p_1 = 11 \cdot 7364$ or $1 \cdot 296$. The larger value of p_1 is inadmissible, because, combined with $p_2 = -2$ and the resulting values of γ_1 and γ_2, it gives a negative value for c_1^2, by equation (4). Accordingly we are confined to the smaller value of p_1, viz., $1 \cdot 296$. By equations (1) and (2) we have $\gamma_1 + \gamma_2 = 1 \cdot 296$, $\gamma_1 \gamma_2 = -2$. Whence one of the γ's, say $\gamma_1 = 2 \cdot 2036$; and the other, $\gamma_2 = -0 \cdot 9076$. Substituting these values of p_1, p_2, γ_1, γ_2, in equations (4) and (5), I find $c_1 = 4 \cdot 105$, $c_2 = 3 \cdot 827$.

Thus, if we put f (x) for the error-function with unit modulus, that is $\dfrac{1}{\sqrt{\pi}} e^{-x^2}$, the ordinate representing the frequency[16] of the observations may be written

$$a \frac{1}{4 \cdot 105} \ \mathrm{f}\left(\frac{x - 2 \cdot 2036}{4 \cdot 105}\right) + \beta \frac{1}{3 \cdot 827} \ \mathrm{f}\left(\frac{x + 0 \cdot 9076}{3 \cdot 827}\right)$$

[13] See note 15.

[14] It is clear that after this limit has been passed, as we increase the absolute numerical value of the negative quantity p_2, the solution of the quadratic continues to be imaginary.

[15] Corresponding to any assigned value of p_2 there are in general two values of p_1. These values are identical at the limit $p_2 = -2.93 \ldots$ In the neighbourhood of that limit—as we ascend towards the other limit $p_2 = -1.289 \ldots$ both values of p_1 are admissible. But ultimately the larger value of p_1 becomes inadmissible, as it gives a negative value to c_1^2 by equation (4). This is the case in the neighbourhood of the value of p_2, which makes the smaller value of p_1 zero (viz., $p_2 = -1.289 \ldots$), and continues to be the case for the whole series of values of p_2 from -1.289 to zero.

[16] That is the proportionate frequency, the actual frequency $\div$ total number of observations (*cf. Journal of the Royal Statistical Society*, 1898, p. 672, note 6).

where a and β represent the area of the respective components, which are inversely proportional to the distances from the centre of gravity. That is, since $a + \beta = 1$,

$$a = \frac{-\gamma_2}{\gamma_1 - \gamma_2} \qquad ; \qquad \beta = \frac{\gamma_1}{\gamma_1 - \gamma_2}.$$

$$a = \frac{0 \cdot 9076}{3 \cdot 1112} \qquad ; \qquad \beta = \frac{2 \cdot 2036}{3 \cdot 1112}.$$

Now let us test this solution by inquiring what proportion of the given group of observations may be expected, according to the formula which has been found, to occur on one side, say the negative side, of the observed median. That point, it will be remembered, is distant $0 \cdot 2$ in the negative direction from the centre of gravity;[17] well, with the aid of the usual tables,[18] I find that, if the proposed solution is supposed to be true, the proportion of observations below the median would be $0 \cdot 486$—a very creditable approximation to the observed proportion, namely, $0 \cdot 5$.

A still better result is obtained if we take p_2 at its upper—that is, numerically smaller—limit, viz., $-1 \cdot 289 \ldots$, corresponding to the value of $p_1 = 0$. Then as $\gamma_1 + \gamma_2 = 0$, $\gamma_1 \gamma_2 = -1 \cdot 289$, we have $\gamma_1 = +1 \cdot 1355$; $\gamma_2 = -1 \cdot 1355$.[19] Employing equations (4) and (5) as before, I find $c_1 = 3 \cdot 402$, $c_2 = 5 \cdot 184$. Since γ_1 and γ_2 are numerically equal, with opposite signs, the areas of the two components must be equal. The solution is therefore (f having the same signification as before)—

$$y = \frac{1}{2} \ \frac{1}{5 \cdot 184} \ \mathrm{f}\left(\frac{x - 1 \cdot 135}{5 \cdot 184}\right) + \frac{1}{2} \ \frac{1}{3 \cdot 402} \ \mathrm{f}\left(\frac{x + 1 \cdot 1355}{3 \cdot 402}\right)$$

Applying the same test as before, I find that according to this formula the proportion of the observations below the median (distant $0 \cdot 2$ on the negative side from the origin) would be $0 \cdot 504$ (correct to two places); that is as accurate as the nature of the case admits, the criterion itself, the distance of the median from the centre of gravity, being liable to a certain "probable error."

When an approximately accurate solution, like that which corresponds to $p_2 = 2$, has been hit upon, we may employ known methods to obtain a second and a third approximation, as explained in the Appendix.[20]

A simplification can usually be effected when some of the unknown quantities which are to be determined are presumed to be small. First let it be supposed that the solution is *very nearly* that which is given by treating the observations as ranging under a single probability-curve. Then one of the γ's, say γ_2, on the

[17] As found, *ante, Journal of the Royal Statistical Society*, 1898, p. 679.

[18] *E.g.*, at the end of Demorgan's "Calculus of Probabilities," *Encycloped. Metropol.*).

[19] In this and too many other cases I would not answer for the last decimal being correct.

[20] See Appendix, note 9.

negative side of the centre of gravity, is to be regarded as small,
and the corresponding modulus as very nearly that which would
be found on the supposition of a single probability-curve, that is
very nearly $\sqrt{2\mu_2}$, say $\sqrt{2\mu_2} + \kappa$, where κ is small.   The sought
quantities may then be described as (1) γ_2, or rather, γ_2 being
negative, the numerical value of γ_2 taken positively, say γ_2';
(2) α the proportionate area of the small component; (3) κ, the
correction upon $\sqrt{2\mu_2}$, giving the modulus of the large component.
These three unknown quantities are supposed small.   Not so the
remaining ones: (4) γ_1 the distance (in the positive direction) of
the smaller component's centre from the centre of gravity of the
system; and (5) the modulus of that component, c_2, which it
will be convenient to replace by a new variable, viz., j, where
$j = c_2{}^2 - 2\mu_2$.

To determine these quantities we have the following system of
equations[21]—

(1) $\gamma_2' = \alpha\gamma_1$
(2) $\kappa = -\alpha(\gamma_{12} + \frac{1}{2}j) \div \sqrt{2\mu_2}$
(3) $\alpha = \mu_3 \div \gamma_1(\gamma_1{}^2 + \frac{3}{2}j)$
(4) $j^2 + 2j\gamma_1(2\gamma_1 - \nu) + \frac{4}{3}\gamma_1{}^3(\gamma_1 - \nu)$;

where ν is a constant connected with the given constants thus:
$\nu = (\mu_4 - 3\mu_2{}^2) \div \mu_3$.

The system is indeterminate, as there are only four equations
for five unknown quantities.   It is proper, as in the general case,
to discover a suitable solution by tentatively assigning values to
one of the variables.   In the present case γ_1 may be selected to
make trial with.

As before, the suitability of a solution may be tested by the
distance between the centre of gravity and the median, as observed,
and as given by the proposed solution.   The whereabouts of the
solution may be indicated, and the tentative process abridged, by
two preliminary criteria which are derivable from the test adopted.
First γ_2' must be greater than m, the distance of the median from
the centre of gravity.   For, if possible, let the median lie to the
left or negative side of the centre of the principal component.
Then the major portion of each component area—and therefore
the major portion of the compound system—lies on one side (the
positive side) of the median, which is absurd.   A superior limit to
γ_2' is given by the condition

$$(\gamma_2' - m) \div \sqrt{2\mu} < \frac{1}{2}\alpha. \quad [22]$$

More obvious conditions are that α must be positive and a
small fraction, that γ_1 cannot well be greater than the distance of
the outmost observations from the centre of gravity, and that
$2\mu_2 + j \,(= c_2{}^2)$ must be positive.

Take for example the statistics which form the fourth example
of Professor Pearson's second contribution to the Royal Society,[23]

[21] See Appendix, note 10.

[22] This follows from the expansion indicated in Appendix, note 10; it being
remembered that γ_2' has now been put for $-\gamma_2$.

[23] *Transactions*, 1895 A, p. 386.

relating to the heights of school girls at St. Louis. Here, as found by Professor Pearson,

$$\mu_2 = 7{\cdot}0739$$
$$\mu_3 = 2{\cdot}38064 \quad {}^{24}$$
$$\mu_4 = 192{\cdot}17419$$

Whence ν, as above defined, is found to be $5{\cdot}865$. The quadratic for j becomes—

$$j^2 + 2j\gamma_1(2\gamma_1 - 5{\cdot}865) + \frac{4}{3}\gamma_1^3(\gamma_1 - 5{\cdot}865).$$

The range of γ_1 is practically confined within 10, the approximate distance of the observed extremities from the centre of gravity. Trying $\gamma_1 = 7$, I find $j = -4{\cdot}37$; $a = 0{\cdot}008$; $\gamma_2' = 0{\cdot}056$. This value of γ_2' is inadmissible, as it is smaller than m, the distance between the median and centre of gravity, for which I find $0{\cdot}275$.[25]

The *positive* value of j obtained from the quadratic would give a still smaller value for κ (as appears from equation (3) above written), and therefore a still smaller value of γ_2'.

Trying next $\gamma_1 = 4$, I find $j = -4{\cdot}66$; $a = 0{\cdot}066$; $\gamma_2 = 0{\cdot}262$. The value of γ_2' is just too small.

Trying a neighbouring value for γ_1, viz., $3{\cdot}5$, I find $j = -4{\cdot}57$; $a = 0{\cdot}126$; $\gamma_2' = 0{\cdot}44$. This value of γ_2' is above the inferior limit, $0{\cdot}275$. Also it is below the inferior limit, $m + \frac{1}{2} a \sqrt{2\mu_2}$, which here $= 0{\cdot}275 + 0{\cdot}063 \times 3{\cdot}77$. Though the solution passes these preliminary tests, it does not quite satisfy the criterion itself. It seems however to be in the neighbourhood of an appropriate solution which would be reached by a little more adjustment. It may be observed that, if we lower the value of γ_1 as far as $1{\cdot}5$, the negative value of j gives a negative value of α, and is therefore inapplicable. The positive value of j continues, when γ_1 is thus lowered, to give too small a value for γ_2'.

Similar treatment may be applied to the statistics which form Professor Pearson's third example, the measurements of American recruits. Here, as found by Professor Pearson—

$$\mu_2 = 6{\cdot}68122$$
$$\mu_3 = 1{\cdot}31168$$
$$\mu_4 = 135{\cdot}0234$$

Whence ν is found to be $0{\cdot}844$. And the quadratic for j becomes—

$$j^2 + 2j \gamma_1(2\gamma_1 - 0{\cdot}844) + \frac{4}{3} \gamma_1^3(\gamma_1 - 0{\cdot}844)$$

To find a suitable value for j, we have the criterion that m, the distance between the median and the centre of gravity, is $0{\cdot}15$, if I am right in putting the median at $67{\cdot}15$ inches, while the

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[24] I take the liberty of altering the *sign* of Professor Pearson's result; as in the hypothesis here entertained the mean cube of deviations measured from the centre of gravity must be greater on the side on which the small component lies than on the other side; and we have taken that side as the positive one.

[25] $0{\cdot}55$ centimetre, that is, $0{\cdot}275$ of the unit employed by Professor Pearson.

centre of gravity is found by Professor Pearson to be at 67·3 nearly.[26]

Trying $\gamma_1 = 1·5$, we obtain $j = -0·5$ nearly; $a = 0·58$; which seems too large.

A better system is given by $\gamma_1 = 2$; and by $\gamma_1 = 3$ a still better system, namely, $j = -2·75$; $a = 0·09$; $\gamma_2' = 0·27$. This system satisfies the preliminary tests—

$$\gamma_2' > 0·15 < 0·15 + \tfrac{1}{2}\,0·09\,\sqrt{\overline{2 \times 6·6512}};$$

and nearly satifies the criterion itself.

Another kind of simplification consists of the hypothesis that the centres of the component curves are at short distances from the centre of gravity of the system. In this case it may be possible to utilise a datum which is not in general available, namely, the *mean error*,[27] in the sense of the average deviation from the centre of gravity, regarded as positive in both directions. The method will be sufficiently exemplified by its application to a particularly simple case, where, in addition to the assumption just made, it is also assumed that the component curves have the same modulus.

Let c be the common modulus, and γ_2' being defined as before, put $w = \gamma_1\gamma_2' \div c^2$, and $\chi = (\gamma_1 - \gamma_2') \div c$. It being assumed that powers of w above the second, and of χ above the fourth[28] may be neglected, we obtain a manageable equation between the *mean error* as above defined, say, 2M, and the required coefficients, namely—

$$(1) \quad 2M \sqrt{\pi} = c\,(1 + w - \tfrac{1}{6}\,(\chi^2 + w)\,w).[29]$$

The second and third *moments* (or mean powers) furnish two other equations, viz. :—

$$(2) \quad 2\mu_2 = c^2\,(1 + 2w)$$
$$(3) \quad \mu_3 = c^3\,w\chi$$

Eliminating c and χ, and neglecting powers of w above the second, we obtain a quadratic equation for w, which being found, c and χ may be determined from the given equations. Then, χ being found, γ_1 may be determined from the equation $\gamma_1^2 - c\chi\gamma_1 - c^2w = 0$. Also $\gamma_2' = c^2w \div \gamma_1$. I am unable to give an example of this method, not being acquainted with any instance in which the *mean error* has been computed with the nicety required for so fine a calculation. The straightforward method of computation which is

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[26] There is some little difficulty in reconciling Professor Pearson's tabular statement with that which is given in the Report of the International Statistical Congress for 1893, p. 748, for the same statistics, as to the absolute height or origin from which the various heights are measured—a matter, it should be added, which was indifferent to the purpose which Professor Pearson had in hand.

[27] *Cf.* "Methods of Statistics," Jubilee volume of this *Journal*, p. 189.

[28] It is assumed that the contents, the areas, of the two components are not very unequal, not of different orders of magnitude—a case which has been treated in the preceding paragraphs. Accordingly γ_1 and γ_2' are of the same order, and $(\gamma_1 - \gamma_1') \div c$, or χ, is not of a lower order—lower in respect of index, higher in respect of magnitude—than $\sqrt{\gamma_1\gamma_2} \div c$, or $\sqrt{w}$.

[29] See Appendix, note 10.

applied, as shown by Mr. Yule in this *Journal*,[30] to the mean powers of deviation in the ordinary sense, is no longer available when the first powers—or other odd powers—of the deviations are treated as positive, irrespective of their direction.

Probably it would be more satisfactory, even in the simple case supposed—and *à fortiori* when there is any doubt about the smallness of the distances γ_1 and γ_2—to employ the *fourth* moment, in spite of the trouble which its computation costs, rather than the somewhat precarious *first* moment. The equations may now be written as follows :—

Put $\Omega = \gamma_1 \gamma_2{}'$, and $X = (\gamma_1 - \gamma_2{}')$

Then (1.) $\quad \mu_2 = \dfrac{c^2}{2} + \Omega$

(2.) $\quad \mu_3 = \Omega X$

(3.) $\quad \mu_4 = 3\,\dfrac{c^4}{4} + 6\,\dfrac{c^2}{2}\,\Omega + \Omega\,(X^2 + \Omega)$

Eliminating $\dfrac{c^2}{2}$ and X, we obtain a cubic equation for Ω, namely—

$$\Omega^3 - \tfrac{1}{6}\lambda_4\,\Omega - \tfrac{1}{2}\,\mu_3{}^2 = 0\,;$$

where λ_4, as before, after Professor Pearson, is put for $9\mu_2{}^2 - 3\mu_4$.

Take for example the heights of American recruits which have been already referred to.[31] Employing the values of the moments above given, I find, as the cubic for Ω—

$$\Omega^3 + 0\cdot5536\,\Omega - 0\cdot86025 = 0$$

The only possible root of this equation is $\Omega = 0\cdot76$ (nearly) Whence $\dfrac{c^2}{2} = \mu_2 - \Omega = 6\cdot681 - 0\cdot76$, and $c = 3\cdot44$. Also $X = \mu_3 \div \Omega = 1\cdot3117 \div 0\cdot76 = 1\cdot726$. Accordingly $\gamma_1{}^2 - 1\cdot726\gamma_1 - 0\cdot76 = 0$. Whence $\gamma_1 = 2\cdot09$; $\gamma_2 = 0\cdot76 \div 2\cdot09 = 0\cdot36$. If as before f stands for the error-function, the equation of the compound curve which has been constructed may be written—

$$y = \frac{1}{3\cdot44}\left[0\cdot85\,\mathrm{f}\left(\frac{x + 0\cdot36}{3\cdot44}\right) + 0\cdot15\,\mathrm{f}\left(\frac{x - 2\cdot09}{3\cdot44}\right)\right]$$

the origin being the centre of gravity. It will be remembered that this solution is not dependent on the assumption that γ_1 and γ_2 are small. The only assumption made is that the components have the same modulus—an assumption which seems to be justified in the case of human statures by the experience of anthropometers.[32] Accordingly the formula seems to fit the given statistics fairly well, judged by the correspondence between the observed and calculated lower quartile and median.

The statistics of the school girls already referred to admit of a

[30] December, 1897.

[31] See p. 131.

[32] The coefficient representative of dispersion is almost the same for different races and classes of adult males (*cf.* "Methods of Statistics," Jubilee volume of this *Journal*, p. 195). The coefficient is found by Signor Perozzo to be identical for different Italian provinces (*Annali di Statistica*, 1878, p. 240).

Miscellanea.

similar treatment. From the values of the moments given on a preceding page, I find $\frac{1}{6}\lambda_4 = -0.6981$; $\frac{1}{2}\mu_3{}^2 = 2.8337$; and accordingly, as the cubic for $\Omega (= \gamma_1\gamma_2')$, $\Omega^3 + 6.98\Omega - 2.8337$, the only possible root of which is $+0.397$. Whence $X = \frac{\mu_3}{\Omega} = 6.0$ nearly.

$$\gamma_1{}^2 - 6\gamma_1 - 0.397 = 0;$$
$$\gamma^1 = 6.066; \; \gamma_2' = 0.066.$$
$$\frac{c^2}{2} = 7.0739 - 0.397;$$
$$c = 3.82$$

$$y = \frac{1}{3.82}\left[0.917 \text{ f}\left(\frac{x + 0.066}{3.82}\right) + 0.083 \text{ f}\left(\frac{x - 6.066}{3.82}\right)\right]$$

The great difference—6 units, that is, 12 centimetres—between the mean of the types, does not look likely, but the formula seems to fit the given statistics well enough.

The important question now arises, whether, in the simplified cases which have been proposed, *percentiles* may be employed instead of the more laboriously ascertained *moments*? The answer seems to be, that the method of percentiles does not carry us very far. The difficulty of connecting the observed percentiles with the sought coefficients by equations which are rational, not transcendental, appears to be in general insurmountable.

Thus, in the first simplification above considered, where the component groups are assumed to be very unequal, it will be found, I think, that the criterion for determining an appropriate solution by means of percentiles cannot be reduced to an ordinary equation.

In one case of particular simplicity a convenient, though inexact, solution is obtainable from percentiles. Let it be assumed, as on the preceding page, not only that the centres of the components are near the centre of gravity, but also that both groups have the same modulus, say, c.

Then we have for $\gamma_1 \div c$, which may be called g_1, a quadratic equation :—[33]

$$(1) \quad g_1{}^2 - g_1 \times \frac{3\mu}{\omega} - \omega = 0;$$

where ω as before denotes gg_2', and μ is defined as follows: Let Q_1 be the distance of a certain percentile, say the quartile, in the positive direction from the median, and Q_2 the corresponding distance in the negative direction. Then $\mu = 1.05 \times (Q_1 - Q_2) \div (Q_1 + Q_2)$.[34] We have also—

$$(2) \quad c = \tfrac{1}{2}(Q_1 + Q_2) \div 0.4769 \; (1 + \omega).$$

From these equations the values of the required coefficients may easily be found, if ω is given. But ω is not given; it has to

[33] See Appendix, note 11, *sub finem.*
[34] *Ibid.*

be tentatively assumed, the resulting solution being tested by percentiles (other than the one which entered into the construction, namely the quartile), or by some other summary criterion. A superior limit is given by the condition that ω must be a small fraction, say not exceeding 0·3. An inferior limit is given by the condition that ω should not be much less than $\mu^{\frac{2}{3}}$. [35]

Take for example the statistics of American recruits, which have already so often done duty. Taking for the median 67·151, I find for Q_1 1·803, and for Q_2 1·658.

$$\text{Whence } Q_1 - Q_2 = 0·145$$
$$Q + Q_2 = 3·461$$

Whence $\mu = 0·044$; $g_1{}^2 - \dfrac{0·132}{\omega} g_1 - \omega = 0$.

Putting $\omega = 0·2$, we have $g_1{}^2 - 0·66g_1 - 0·2 = 0$

Whence $g_1 = 0·886$; $g'_2 = 0·226$; $c = 3·461 \div 2 \times 0·4769 \times (1 + 0·2) = 3·024$; $\gamma_1 = g_1 \times c = 2·68$; $\gamma_2' = g_2' \times c = 0·68$.

Other equally plausible solutions may be obtained by values of ω between the limits 0·3 and 0·13, from which a selection is to be made by some workable criterion.

A more determinate system of equations is obtainable in the case supposed from the percentiles. But, considering the labour of handling those equations, and the precariousness of the hypothesis on which they are founded, it is better to proceed on the lines of Professor Pearson's method. That method may admit of occasional short cuts; but it is not safe to diverge much from the track of the original path-breaker.

APPENDIX.

NOTE 9 (referring to p. 129).

A Method of Approximation.

If, as above, f(x) is put for the error-function, and $\theta(x)$ for that integral of the same ($\times 2$), which is tabulated in the books on Probabilities, then m being the distance in absolute number (or without *sign*) of the observed median from the centre of gravity—in the cases supposed in the negative direction from that centre—taking γ_2 as negative, we have for the proportion of observations below the observed median which is given by particular values of $\gamma_1, \gamma_2, c_1, c_2$—

$$\frac{\gamma_1}{\gamma_1 - \gamma_2}\left(\frac{1}{2} + \frac{1}{2}\theta\left(\frac{-\gamma_2 - m}{c_2} \right) \right) + \frac{-\gamma_2}{\gamma_1 - \gamma_2}\left(\frac{1}{2} - \frac{1}{2}\theta\left(\frac{\gamma_1 + m}{c_1} \right) \right)$$

an expression which ought to be equal to 0·5 if the sought

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[35] To secure that μ may be of the order $\omega^{\frac{3}{2}}$, which is implied when quantities of the order ω^2 are retained while quantities of the order $\mu\omega$ are neglected (see Appendix, note 11).

quantities γ_1, γ_2, c_1, c_2, had been found exactly. Put R as the (supposed small) difference between what the expression is and what it ought to be. Then substituting $\gamma_1 + \Delta\gamma_1$ for γ_1 and so on, expanding and neglecting quantities of the second and higher orders, we obtain an equation for the corrections $\Delta\gamma_1$, $\Delta\gamma_2$, Δc_1, and Δc_2, of the form $E\Delta\gamma_1 + F\Delta\gamma_2 + G\Delta c_1 + H\Delta c_2$; where E, F, G, and H are numerical coefficients, of which the computation is facilitated by remembering that $\frac{1}{2}\theta'(x)$, $= f(x)$ and that the values of $f(x)$ are obtainable from the tables in the books as the first differences of $\frac{1}{2}\theta$.

Likewise from the *five* equations in the text—involving, in addition to the four unknowns γ_1, γ_2, c_1, and c_2, two introduced dependent variables p_1, p_2—we may obtain five linear equations involving the six small quantities $\Delta\gamma_1$, $\Delta\gamma_2$, Δc_1, Δc_2, Δp_1, Δp_2.

We have thus a determinate and not very difficult system of simple equations from which the required corrections may be found.

Note 10 (referring to p. 130).

Expressions for Mean Powers of Deviation used in the Method of Separation.

A suitable equation may be obtained from the first power of deviation taken positively on both sides of the centre of gravity, when the centre of each component curve is at a distance from the common centre of gravity that is small in relation to the modulus of that component. Begin with the simplest case in which the components have the same modulus, say c, and the central distances are the same, say γ. Then the mean first power of deviation in one direction, say the positive, may be written—

$$M = \frac{1}{2}\int_0^\infty \frac{1}{\sqrt{\pi c}}\, e^{-\frac{(x-\gamma)^2}{c^2}}\, dx + \frac{1}{2}\int_0^\infty \frac{1}{\sqrt{\pi c}}\, e^{-\frac{(x+\gamma)^2}{c^2}}\, dx.$$

Transforming this expression suitably, we have—

$$M = \frac{1}{2}\frac{c}{\sqrt{\pi}} + \frac{1}{2}\frac{2}{\sqrt{\pi}}\gamma\int_0^{\frac{\gamma}{c}} e^{-x^2}dx - \frac{1}{2}\frac{2}{\sqrt{\pi}}c\int_0^{\frac{\gamma}{c}} x\, e^{-x^2}dx$$

Expanding each integral as a function of the small quantity $\frac{\gamma}{c}$, we have—

$$M\sqrt{\pi} = \frac{1}{2}c + \frac{1}{2}2\gamma\left(\frac{\gamma}{c} - \frac{1}{3}\frac{\gamma^3}{c^3} + \&c.\right) - \frac{1}{2}2c\left(\frac{1}{2}\frac{\gamma^2}{c^2} - \frac{6}{24}\frac{\gamma^4}{c^4} + \&c.\right)$$

$$= \frac{1}{2}c + \frac{1}{2}\left(\frac{\gamma^2}{c} - \frac{1}{6}\frac{\gamma^4}{c^3}\right),$$ higher powers of $\frac{\gamma}{c}$ being neglected,

or, putting $\left(\frac{\gamma}{c}\right)^2 = \omega$, $2M\sqrt{\pi} = c(1 + \omega - \frac{1}{6}\omega^4)$.

There is no difficulty about extending this analysis to the case when the γ's are unequal. If ω now equal $\gamma_1 \times \gamma_2 \div c^2$, we have $2M\sqrt{\pi} = c(1 + \omega + \&c.)$ as given in the text on p. 132, where $2M$ is to be understood as the sum of the mean deviations measured on both sides of the centre of gravity.

The expressions for the second, third, and fourth mean powers employed in the text at p. 133, correspond to Professor Pearson's fundamental equations (10), (11), and (12), of the first contribution (*Transactions of the Royal Society*, 1894), *mutatis*—I do not say *mutandis*—but *mutabilibus*: in particular the " modulus " being employed instead of the " standard deviation," rather for the sake of consistency with former writings in this *Journal*, than convenience on the present occasion The equations given in the text at p. 130 are derived from the expressions here indicated, by expansion in ascending powers of small quantities. The proposition employed in the text at p. 133, that when the components have the same modulus $\mu_3 = \gamma_1 \gamma_2' \, (\gamma_1 - \gamma_2')$ may be verified by subtracting Professor Pearson's equation (19) from his equation (18), it being remembered that his p_1 corresponds to our $\gamma_1 - \gamma_2'$, his p_2 to our $- \gamma_1 \times \gamma_2'$.

NOTE 11 (referring to pp. 134 and 135).

On the Use of Percentiles in the Method of Separation.

Percentiles may be used to obtain manageable equations connecting the *data* with the *quæsita* when certain of the sought variables are small. But the equations prove troublesome, except in the simpler cases—or rather the simplest case, in which the distances between the centres of the components and the centre of gravity of the compound are not only small, but equal, while both the components have the same modulus.

This case might be supposed to arise by the dislocation of two originally coincident and equal probability-curves, one being translated in a positive, the other in a negative direction, to the same small distance, viz., γ. The centre of the system will not be affected by this dislocation, but the percentiles other than the median will be disturbed. Consider any particular percentile, say the quartile on the positive side of the centre. Before the dislocation, the quartile of the system was at a distance cq from the centre, where c is the modulus common to both components, and q is the well-known fraction of the modulus which corresponds to the quartile or " probable error," namely, $0\cdot4769$ . . . After the dislocation let the quartile of the system be at $cq + x'$ measured from the centre of the system. It is therefore distant in the positive direction $\gamma + x'$ from the quartile of the component which has been moved back, and $\gamma - x'$ in the negative direction from the quartile of the component which has been moved forward. And, since the components are equal, the percentage by which the proportion of the negatively displaced group that is intercepted between its centre and the quartile of the compound exceeds a quarter, must be equal to the percentage by which the proportion of the positively displaced group that is intercepted between its centre and the quartile of the compound falls short of a quarter. In symbols,

$$\tfrac{1}{2}\theta\left(q + \frac{(\gamma + x')}{c}\right) - \tfrac{1}{2}\,\theta(q) = \tfrac{1}{2}\,\theta(q) - \tfrac{1}{2}\,\theta\left(q - \frac{\gamma - x'}{c}\right).$$

Expanding and neglecting higher powers of small quantities,

we have a rational equation connecting c, γ, and x'. The last variable is to be eliminated by means of the equation

$$Q = cq + x',$$

where Q is the distance of the quartile from the median, a quantity given by observation. The equation between c and γ thus obtained is to be combined with another equation, obtained either from another percentile, or from some other easily attainable datum, in particular, the "mean error"—or mean first power taken positively in both directions, or the mean square of error.

It might appear at first sight that powers of $\gamma \div c$ above the first could be neglected. But it will be found that a determinate system is not thus attainable. The value of x' would be on that understanding $q\gamma^2 \div c$. Whence $Q = cq(q + \omega)$ if ω is put for $\gamma^2 \div c^2$. By parity the equation obtained from some other percentile is of the form—

$$\frac{R}{r} = c(1 + \omega):$$

presenting another observation for the quantity $c(1 + \omega)$, not an independent equation, by means of which and the preceding one c and ω may be determined. Similarly, if we employ the mean error, or the mean square of error, neglecting powers of ω above the first, we obtain equations of the form—

$$2M\sqrt{\pi} = c(1 + \omega)$$
$$\sqrt{2\mu_2} = c(1 + \omega);$$

which are equally unsuited to our purpose.

To obtain a determinate system it is necessary to proceed to the second power of ω. The equation presented by the percentile becomes—

(2) $q\xi^2 - \xi(1 + (2q^2 - 1)\omega) + q\omega + \frac{1}{6}(2q^3 - 3q)\omega^2 = 0$

where ξ is put for $x' \div c$

In this equation Q and q may be replaced by R and r, corresponding to any other percentile; R being the distance between which and the median a certain proportion, say ρ, of the given group is observed to be intercepted, and r is such that $\frac{1}{2}\theta(r) = \rho$.

Substituting in the equation thus modified, for ξ, $\dfrac{R}{c} - r$, or, as it may be more convenient to write, $(Rh - r)$, we obtain one equation between h and ω. A second equation is supplied by the mean error (higher powers of ω being neglected), as shown in the preceding note, viz. :—

$$h = \frac{1}{2M\sqrt{\pi}}(1 + \omega - \frac{1}{6}\omega^2)$$

Substituting this value of h in the first equation, still neglecting powers of ω above the second, we obtain a quadratic equation for ω.

Instead of the mean error we might have employed a second percentile to obtain a second equation connecting c and ω. But though the trouble of obtaining this datum is much less, the trouble of applying it to the elimination of c is somewhat greater.

The troublesomeness of the problem is much increased when we introduce the more general hypothesis that the γ's are not equal. It is now hardly worth the trouble of solving the equations, on the chance that the hypothesis of small distances and equal moduli will prove appropriate. However, it may be instructive to indicate how the required eliminations are now to be effected. Let it be supposed that the system, as before, is generated by the dislocation of two normal groups of equal modulus, originally having the same centre. Only now the areas of the two components and the distances to which they are respectively translated are no longer supposed equal. The centre of gravity being supposed to be unaltered by the dislocation, the areas of the component curves must be inversely proportional to the displacements γ_1 and γ_2' (the absolute quantity of the negative displacement). Accordingly the principle of equation (1) may be employed to determine the disturbance of any of the percentiles, say that of the upper quartile, viz. x_1' (not now identical with the disturbance of the lower quartile) from its original position at the distance cq from the centre of gravity. The analogue to equation (2) is—

(3) $\quad q\xi_1{}^2 - \xi_1(1 + (2q^2 - 1)\,w) + {}^{\cdot}qw + \frac{1}{3}\,(2q^2 - 1)\,w\chi +$
$$\frac{1}{6}\,(2q^3 - 3q)\,w\,(w + \chi^2)$$

where $\xi_1 = x'_1 \div c$; $\ w = \gamma_1\gamma'_2 \div c^2$; $\ \chi = (\gamma_1 - \gamma'_2) \div c$ (*cf.* above p. 132); and it is assumed that $w\chi$ is not of a lower order—lower in respect of index, higher in respect of magnitude—than $w^{\frac{3}{2}}$ (*cf.* note to p. 132). To eliminate ξ_1 we have now the equation (4) $Q_1 = c(q + \xi_1) + m$; where Q_1 is the distance of the quartile on the upper or positive arm—here supposed the longer—from the median, and m is the distance (in a negative direction) from the centre of gravity of the compound system. Now m may be found in terms of c, w, and χ from the formula given at the beginning of the ninth note in our Appendix. Expanding and neglecting higher powers of small quantities, we have

$$(5) \qquad \frac{m}{c} = \frac{1}{3}\,\gamma_1\gamma'_2\,(\gamma_1 - \gamma'_2) \div c^3$$

That is, in the present notation, $m = \frac{1}{3}\,w\chi c$. Substituting this value in equation (4) we get rid of m.

To determine χ, the following method may be recommended. The distance of the *lower* quartile, Q_2, from the median $= c(q + \xi_2) - m$; where $c\xi_2$ is the correction on cq measured from the centre of gravity, which (together with the subtraction of m) is required by the dislocation of the originally concentric groups. Now by equation (3) and the corresponding equation for ξ_2 we have—neglecting small quantities—

$$(Q_1 - Q_2) \div c = \frac{2m}{c} + \frac{2}{3}\,(2q^2 - 1)\,w\chi$$

that is by equation (5) $= \frac{4}{3}\,q^2w\chi$.

Also for c we have the equation
$$(Q_1 + Q_2) = 2cq\,(1 + w + \&c.)\,;$$

substituting in the expressions for Q_1 and Q_2 the approximate values of ξ_1 and ξ_2. Substituting the value of c derived from the last equation in the preceding equation, we have

$$\frac{4}{3} q^2 \chi w = \frac{Q_1 - Q_2}{Q_1 + Q_2} \times 2q(1 + w + \&c.)$$

Restoring to q its numerical value, and assuming that χw is of the order $w^{\frac{3}{2}}$—corresponding to the assumption that the γ's are of the same order, the areas not being very unequal, a case which has been treated by a different method—we have

$$\frac{1}{3} \chi w = 1 \cdot 05 \frac{(Q_1 - Q_2)}{Q_1 + Q_2}$$

To eliminate c from equation (3), there is still required another equation; it may be based on another observed percentile. Probably it would be best first to ascertain χw from the two quartiles as above, and then to observe *two* new percentiles, R and S—it might be one above and one below the quartile on the same side of the median—from which to construct two new equations of the same type.

But to build so elaborate a construction on an hypothesis that may prove inadmissible is precarious. The summary method given in the text appears to be the most useful outcome of the theory.

(*To be continued*).

II.—*The Statistics of Wages in the United Kingdom during the last Hundred Years.* (PART I.) *Agricultural Wages.* — Contd. SCOTLAND. By A. L. BOWLEY, M.A.

THE information as regards Scotch agricultural wages is not so discursive nor so complete as that for England. Between 1790 and 1814 two Statistical Accounts of Scotland, one village by village, the other county by county, were drawn up in some seventy volumes under the direction of Sir John Sinclair, who in 1814 summarised them in *The General Report on Scotland.* His summary unfortunately is not comprehensive enough to avoid the necessity of studying the separate volumes *seriatim.* In 1834-45 a second similar account came into existence containing very valuable figures for those dates, especially complete as regards the wages of day labourers and farm servants. The figures resulting from this survey are based on a very wide average, but unfortunately it is often difficult to allocate the date exactly. A group of parliamentary reports at about the same date are quoted in some detail by Drummond (*Condition of the Agricultural Labourer,* 1833-40) and Symons (*Arts and Artisans at Home and Abroad*). Purdy, in the *Statistical Journal* of 1862, compares the second Statistical Account with official Returns of Day Labourers' Wages of 1861 corresponding to the English Returns of the same date. The

reports of the *Commission on Women and Children*, 1867-70, and the *Richmond Commission* are summarised by Mr. Little in his appendix to the Labour Commission; the *Labour Commission* is also full of new estimates of wages (*The Agricultural Labourer*, vol. iii).

TABLE 1.—*Day Labourers. Average of Summer and Winter Daily Wages.*

	1790.	1794.	1810.	1834-45.	1860.	1867-70.	1880-81.	1890-92.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Wigtown	- 11	- 11	1 7	1 3	1 11	2 1	2 6	2 10
Kirkcudbright	- 11	1 2	1 7	1 5	2 -	2 9	2 9	2 9
Dumfries	- 11	1 1	1 7	1 7	2 -	2 9	2 9	3 -
S.W. index number	32	37	56	50	69	88	93	100
Selkirk	1 1	1 1	2 -	1 7	2 4	2 9	2 11	2 9
Peebles	- 11	- 11	1 7	1 7	2 2	2 6	2 3	2 9
S. Central index number	36	36	64	57	81	95	93	100
Roxburgh	1 1	1 3	2 -	1 8	2 4	2 4	2 10	2 9
Berwick	1 -	1 2	2 -	1 7	2 6	2 4	3 -	2 9
Haddington	1 -	1 1	2 -	1 6	2 3	2 4	3 -	3 -
S.E. index number	36	41	70	55	83	82	104	100
Edinburgh	1 1	1 1	2 -	1 8	2 4	2 5	2 9	3 1
Linlithgow	1 1	1 3	2 -	1 6	2 2	2 5	2 9	3 3
Lothians index number	34	37	64	50	72	76	88	100
Clackmannan	- 11	1 1	1 7	1 9	2 3	2 -	2 6	3 -
Kinross	1 -	1 -	1 7	1 7	2 -	2 4	2 6	3 -
Fife	- 11	1 -	1 7	1 7	2 -	2 4	2 6	3 -
Mid. E. index number	31	34	53	54	69	74	83	100
Ayr	1 2	1 5	1 10	1 8	2 8	2 -	3 -	3 -
Lanark	1 1	1 2	1 8	1 9	2 6	2 6	3 3	3 3
Renfrew	1 1	1 4	1 10	1 10	2 -	2 7	3 -	3 3
Dumbarton	1 1	1 2	1 10	1 9	2 6	2 9	3 3	3 3
Stirling	1 1	1 2	1 10	1 8	2 4	2 6	3 -	3 3
Mid. W. Index number	34	39	56	54	75	77	97	100
S. SCOTLAND average	1 0	1 2	1 9	1 7	2 3	2 5	2 10	3 0
S. SCOTLAND index number	34	38	59	54	75	81	94	100

Note.—Figures in this type, 9 8, are interpolated.

TABLE 1 *Contd.—Day Labourers. Average of Summer and Winter Daily Wages.*

	1790.	1794.	1810.	1834-45.	1860.	1867-70.	1880-81.	1890-92.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Perth	1 —	1 3	1 7	1 6	2 —	2 3	2 8	3 6
Forfar	- 11	1 3	1 7	1 8	2 4	2 4	2 10	3 —
Kincardine	- 10	- 11	1 11	1 6	2 3	2 —	2 11	3 +
E. Central index number	29	36	54	49	70	70	89	100
Aberdeen	- 9	1 —	1 8	1 7	2 3	2 2	2 9	3 —
Banff	- 10	- 11	1 8	1 6	2 3	2 6	2 9	3 —
Elgin	- 10	- 11	1 8	1 4	2 4	2 6	2 10	3 —
Nairn	- 10	- 11	1 8	1 5	2 4	2 6	2 11	3 —
N.E. index number	27	31	57	49	76	81	94	100
Argyll	- 10	- 10	1 3	1 5	2 4	1 6	2 3	3 —
Inverness	- 9	- 9	1 3	1 4	2 2	2 2	2 6	2 8
W. Central index number	28	28	44	49	79	65	84	100
Ross and Cromarty	- 6	- 9	1 1	1 2	1 11	2 2	2 11	3 —
Sutherland	- 7	- 9	1 1	1 5	2 —	2 —	2 8	3 —
Caithness	- 8	- 10	1 1	1 5	1 11	2 2	2 9	2 8
N. index number	20	27	38	46	67	73	96	100
N. SCOTLAND average	- 9	- 11	1 5	1 5	2 2	2 2	2 9	3 0
N. SCOTLAND index number	26	31	49	48	73	73	91	100
SCOTLAND average	- 11	1 1	1 8	1 6	2 3	2 4	2 9	3 0
SCOTLAND index number	31	35	55	51	74	78	93	100

Note.—Figures in this type, 2 3, are interpolated.

Table 1 shows the average of the summer and winter wages of day labourers for all counties, except Bute and the islands, in those years for which general information exists. It is generally stated that the winter wage is earned for sixteen weeks, a special harvest wage for one month, and the summer wage for the rest of the year. It is not easy to calculate from such data the actual earnings in the year, for we do not know how much is lost by bad weather, nor how many days' work are obtained even in a good season by men engaged by the day. When wages are stated at so much per week, constant employment, they are invariably at a lower rate. These figures are in most cases, however, strictly comparable with each other, and probably indicate accurately the relative position in different counties, and as well as in different years, and the index numbers are practically unaffected by the method of computation.

In this and the two following tables, I have interpolated figures, as the course of wages in adjacent counties, or the rate of change of other classes of agricultural labourers, or information referring to dates not included, suggested. I have not proceeded on so rigid a principle as when dealing with English agriculture, partly because a more elastic method proved more applicable, partly because the Scotch figures as a whole are less precise than the English, and therefore it was useless to strain after too great accuracy. All interpolated figures are shown by a special type, *e.g.*, 9 8, I have not weighted the averages for the reasons given in the former paper.

Table 2 shows the estimated annual earnings of married ploughmen, whether paid in money or kind. The method of payment varies greatly from decade to decade, county to county, and even within the same county. Most investigators have recognised the necessity of endeavouring to obtain accurate valuations of the $6\frac{1}{2}$ bolls of oatmeal, 1,500 yards of potato drill, grass for a cow, house and garden, and carriage of coal, or whatever the items are which go to make up the account; but owing partly to the varying price of oatmeal, which commodity has often accounted for 40 per cent. of the total earnings, partly to the difficulty of valuing the many small privileges, it is seldom easy to decide on the value of the annual earnings in any county within 2 *l*. The most accurate estimates appear to be those of the Labour Commissioners, and I think that the average of 49*l*., which I estimate for 1892 on the basis of these reports, cannot be far in error. As we go back, the ground becomes less certain. For the first two columns I had to estimate these values from the details of kind given in the statistical accounts : when I have done this the resulting figures are thus printed : *86*. When I have had to estimate the value in kind without specific data, I have printed the resulting figures as if simply interpolated. I have given the values of cash and kind separately whenever I have been able to find the data. Though the individual figures are of no great accuracy, it is of course the case that the wider the average the greater is the precision, while the index numbers, depending on ratio only, are again more precise ; but it is to be noticed that we do not gain in

Table 2.—*Estimated Annual*

	1794.			1810-13.			1834-43.		
	Cash.	Kind.	Total.	Cash.	Kind.	Total.	Cash.	Kind.	Total.
	£	£	£	£	£	£	£	£	£
Wigtown	....	....	17	....	....	30	....	....	25
Kirkcudbright	....	....	17	....	....	30	....	....	25
Dumfries	....	....	17	....	....	37	....	....	22
S.W. index number	....	....	*38*	....	....	*73*	....	....	*54*
Selkirk	6 +	*10* =	*16*	12 +	*17* =	*29*	....	....	25
Peebles	6 +	*10* =	*16*	12 +	*17* =	*29*	10 +	*15* =	25
S. Central index number	....	....	*35*	....	....	*64*	....	....	*55*
Roxburgh	0 +	16 =	*16*	0 +	35 =	*35*	....	....	30
Berwick	0 +	17 =	*17*	0 +	33 =	*33*	4 +	$21\frac{1}{2}$ =	$25\frac{1}{2}$
Haddington	6 +	12 =	*18*	12 +	15 =	*27*	9 +	15 =	24
S.E. index number	....	....	*35*	....	....	*64*	....	....	*54*
Edinburgh	7 +	9 =	*16*	12 +	15 =	*27*	16 +	10 =	26
Linlithgow	6 +	9 =	*15*	12 +	*15* =	*27*	....	....	26
Lothians index number	....	....	*30*	....	....	*52*	....	....	50
Clackmannan	6 +	6 =	*12*	12 +	*15* =	*27*	14 +	$8\frac{1}{2}$ =	$22\frac{1}{2}$
Kinross	6 +	*10* =	*16*	12 +	*15* =	*27*	....	....	23
Fife	6 +	9 =	*15*	12 +	*15* =	*27*	10 +	15 =	25
Mid E. index number	....	....	*28*	....	....	*53*	....	....	*46*
Ayr	....	....	16	....	....	27	14 +	13 =	27
Lanark	....	....	16	....	....	27	....	....	25
Renfrew	....	....	16	....	....	27	....	....	26
Dumbarton	....	....	16	16 +	19 =	35	....	....	32
Stirling	....	....	16	....	....	35	....	....	25
Mid W. index number	....	....	*28*	....	....	*53*	....	....	*48*
South Scotland average.	....	....	£ 16	....	....	£ 30	....	....	£ $25\frac{1}{2}$
South Scotland index number	....	....	*32*	....	....	*59*	....	....	*50*

Note.—Figures in this type, *10=16*, are

Figures in this type, 25, are

Earnings of Married Ploughmen.

1867-70.			1881.			1892.			
Cash.	Kind.	Total.	Cash.	Kind.	Total.	Cash.	Kind.	Total.	
£	£	£	£	£	£	£	£	£	
14 +	18 =	32	35 +	5 =	40	25 +	18 =	43	Wigtown
32 +	5½ =	37½	22 +	16 =	38	39½ +	4½ =	44	Kirkcudbright
32 +	3 =	35	42 +	3 =	45	41 +	5 =	46	Dumfries
....	....	78	....	....	93	....	....	100	S.W. index number
18 +	22 =	40	22 +	26 =	48	....	....	45½	Selkirk
21½ +	17½ =	39	34 +	14½ =	48½	....	....	45½	Peebles
....	....	88	....	....	106	....	....	100	S. Central index number
5 +	36 =	41	....	....	52	....	....	50	Roxburgh
5 +	36 =	41	....	....	50	....	....	48	Berwick
26½ +	13 =	39½	34 +	15 =	49	....	....	51	Haddington
....	....	81	....	....	101	....	....	100	S.E. index number
26½ +	12½ =	39	....	....	49½	....	....	51	Edinburgh
26 +	12½ =	38½	....	....	48½	38 +	16 =	54	Linlithgow
....	....	74	....	....	93	....	....	100	Lothians index number
....	....	34½	....	....	42	....	....	51	Clackmannan
....	....	36	....	....	43	....	....	51	Kinross
18 +	20½ =	38½	....	....	44	....	....	51	Fife
....	....	71	....	....	84	....	....	100	Mid E. index number
24½ +	13½ =	38	42 +	1 =	43	35 +	15 =	50	Ayr
21½ +	16 =	37½	32½ +	14½ =	47	52 +	7½ =	59½	Lanark
23 +	17 =	30	32 +	24 =	56	51 +	8 =	59	Renfrew
....	....	40	....	....	56	53 +	7 =	60	Dumbarton
25 +	15 =	40	....	....	44	40 +	15 =	55	Stirling
....	....	65	....	....	87	....	....	100	Mid W. index number
		£			£			£	
....	....	38	....	....	47	....	....	51	SOUTH SCOTLAND average
....	....	74	....	....	92	....	....	100	{ SOUTH SCOTLAND index number

estimates based on stated details of kind.
interpolated.

TABLE 2—*Contd.*—*Estimated Annual Earnings*

	1794.			1810-13.			1834-43.		
	Cash.	Kind.	Total.	Cash.	Kind.	Total.	Cash.	Kind.	Total.
	£	£	£	£	£	£	£	£	£
Perth...............................	7 +	10 =	17	12 +	15 =	27	12 +	13 =	25
Forfar	7 +	9 =	16	12 +	18 =	30	13 +	13 =	26
Kincardine	7 +	8½ =	15½	12 +	15 =	27	12½ +	11½ =	24
E. Central index number...	....	....	33	....	....	58	....	....	52
Aberdeen	6 +	9½ =	15½	10 +	16 =	26	....	....	26
Banff....................................	6 +	9½ =	15½	10 +	16 =	26	....	....	26
Elgin.....................................	6 +	9½ =	15½	10 +	16 =	26	11 +	15 =	26
Nairn....................................	6 +	9½ =	15½	10 +	16 =	26	....	....	26
N.E. index number............	....	....	35	....	....	58	....	....	58
Argyll	6 +	6 =	12	12 +	15 =	27	....	....	26
Inverness	6 +	6½ =	12½	12 +	15 =	27	13 +	13 =	26
W. Central index number.	....	....	25	....	....	56	....	....	54
Ross and Cromarty................	6 +	5 =	11	9 +	15 =	24	7½ +	11½ =	19
Sutherland	....	....	7½	....	....	20	....	....	16
Caithness	3 +	5½ =	8½	....	....	21	....	....	16
N. index number................	....	....	22	....	....	53	....	....	41
NORTH SCOTLAND average	....	....	£ 13½	....	....	£ 25½	....	....	£ 23½
NORTH SCOTLAND index number .... }	....	....	30	....	....	56	....	....	52
SCOTLAND average	....	....	£ 15	....	....	£ 28	....	....	£ 25
SCOTLAND index number...	....	....	31	....	....	58	....	....	51

of Married Ploughmen.

1867-70.			1881.			1892.			
Cash.	Kind.	Total.	Cash.	Kind.	Total.	Cash.	Kind.	Total.	
£	£	£	£	£	£	£	£	£	
23 +	15 =	38	30 +	14 =	44	33 +	17 =	50	Perth
21 +	19 =	40	25 +	23 =	48	30 +	20 =	50	Forfar
....	....	35	26 +	21 =	47	29 +	16 =	45	Kincardine
....	....	78	....	....	96	....	....	100	E. Central index number
18 +	15 =	33	26 +	19 =	45	30 +	15 =	45	Aberdeen
22 +	11 =	33	26 +	19 =	45	28 +	17 =	45	Banff
$20\frac{1}{2}$ +	11 =	$31\frac{1}{2}$	25 +	13 =	38	29 +	16 =	45	Elgin
20 +	11 =	31	25 +	$13\frac{1}{2}$ =	$38\frac{1}{2}$	29 +	16 =	45	Nairn
....	....	72	....	....	92	....	....	100	N.E. index number
17 +	$18\frac{1}{2}$ =	$35\frac{1}{2}$	22 +	17 =	39	24 +	26 =	50	Argyll
14 +	19 =	33	....	....	40	....	....	47	Inverness
....	....	71	....	....	81	....	....	100	W. Central index number
13 +	20 =	33	23 +	18 =	41	25 +	21 =	46	Ross and Cromarty
13 +	9 =	22	....	....	40	20 +	$21\frac{1}{2}$ =	$41\frac{1}{2}$	Sutherland
$10\frac{1}{2}$ +	25 =	$35\frac{1}{2}$	$18\frac{1}{2}$ +	$21\frac{1}{2}$ =	40	15 +	21 =	36	Caithness
....	....	73	....	....	98	....	....	100	N. index number
....	....	£ 33	....	....	£ 42	....	....	£ $45\frac{1}{2}$	NORTH SCOTLAND average
....	....	74	....	....	92	....	....	100	{ NORTH SCOTLAND index number
....	....	£ 36	....	....	£ 45	....	....	£ 49	SCOTLAND average
....	....	74	....	....	92	....	....	100	SCOTLAND index number

precision so much as usual by the use of index numbers, for it is
rarely that the estimates for different years have been made by the
same person. It is much to be regretted that Sinclair did not
complete his tables by a statement of a general money average,
and that Mr. Little was not able to summarise the Scotch returns
for the Labour Commission. In spite of all these difficulties the
result appears to me to be reliable, first because the rates of change
shown in Tables 1 and 2, which show the results of calculations
totally independent of each other, are in such remarkably close
agreement, and secondly, because out of the 69 index numbers I
obtained for different classes and counties in 1794, few were far
from the average 31, and they were grouped about this average
with fair regularity.

TABLE 3.—*Annual Wages of Unmarried Farm Servants. In Addition to Maintenance in Kitchen or Bothy.*

	1790.	1794.	1804-14.	1814.	1834-45.	1867-70.	1881.	1892.
	£	£	£	£	£	£	£	£
Wigtown	7	8	18	15	10	19	—	21
Kircudbright	7¼	8	18	15	11	19	—	21
Dumfries	7½	8	18	15	12	20	—	26
Selkirk	6½	7	14¾	15	9½	19	—	24
Peebles	6	7	14¾	15	12	21½	—	24
Roxburgh	7½	8	16¾	14	9	18	—	24
Berwick	6½	8	16¾	14	8½	18	—	24
Haddington	6½	7	16¾	14	10	26	—	28
Edinburgh	6½	7½	14	12	10	26	—	28
Linlithgow	7½	10	14	12	10	26	—	28
Clackmannan	6½	7½	14	12	12	20	—	29
Kinross	6	7½	14	12	12	20	—	33
Fife	6	7½	14	12	11	20	—	27
Ayr	8	10	20	15	13	25	29½	31
Lanark	8	10	20	15	12	25	32½	32
Renfrew	9	10	18	15	17	25	32	33
Dumbarton	8	9	19	15	16	25	30	27
Stirling	8	10	19	17	15	24	—	28
S. SCOTLAND average	7	8	17	14	12	22	—	27
Perth	8	9	18	16	12½	20	27½	26
Forfar	7½	9	18	16	12	19	26	30
Kincardine	6	8	18	16	12½	22	26	34
Aberdeen	5	7	18	14	12	22	27	30½
Banff	5½	7½	18	14	11	18	26	29
Elgin	5	6	18	14	10	19	25	29
Nairn	5	6	18	14	10	19	26	29
Argyll	7	8	14	11	10	17	22	26
Inverness	7	8	14	11	9	19	26	21
Ross and Cromarty	4	4	12	10	7	15	23	18
Sutherland	2½	6	11	9	8	22	22	18
Caithness	3	6½	8	8	7½	13½	18½	18
N. SCOTLAND average	5½	7	15	13	10	19	25	28
SCOTLAND average	6	8	16	14	11	21	—	27

Note.—Figures in this type, 15, are interpolated.

Table 3 shows the annual money earnings of agricultural labourers, who are boarded and lodged by the farmers, either in the kitchen or in the " bothy," *i.e.*, a building where the unmarried male labourers of a farm have their meals and sleep. These wages are very generally given in the returns, and are interesting in themselves, but they are not of great precision, since it is not always possible to distinguish between the wages of a fully qualified labourer and those of a mere lad, and they do not always bear a constant proportion to total earnings (cash and maintenance), for as we look back before 1790, we find in the northern counties the money wages very small. It is not possible to make a good estimate of the value of maintenance, for the food must have changed in quality as well as in price, and the lodging has probably improved. I have for these reasons given a simple average of these figures, interpolating where necessary, and merely point out that their general course is perfectly consistent with the results obtained in Tables 1 and 2.

In Table 4 I have endeavoured to follow out the same scheme as when dealing with the English counties. The materials, however, are not sufficiently complete to make it worth while to print estimates for each county separately; I have, therefore, grouped contiguous counties, where the same rates of wages generally prevail, together. In drawing up these index numbers I have paid attention to the rate of change of all classes of labourers, forming index numbers for each class. The varieties of type, which correspond exactly to those used for the English counties, show the reliance to be placed on the separate figures.

Thus figures which are well supported by several statements referring to different counties and classes are printed thus: 12; when reports are not in sufficient agreement or are too scanty, the figures are smaller, thus: 13; when we have an isolated or unsupported statement, thus: (56); when the figures rest on good evidence, but, as is often the case in the Statistical Accounts, the exact date is uncertain, they are italicised, thus: *92*.

The chief comparative statements are:—Renfrew, 1792-1810, Clackmannan, 1754-96, and Ayr, 1720-1809, in the first group of statistical accounts; Fife, 1750-1834 and 1786-1838, Perth, 1772-1837, in the second group; Elgin, 1860-81, and Banff 1843-81, in the Richmond Commission; and Kirkcudbright, 1760-1813, in Malthus's *Measure of Value*.

There appears to be no existing estimate for average agricultural wages in Scotland, which we may put alongside Mr. Little's estimate of 39*l.* for the English and Welsh agricultural labourer in 1891. There is not, however, any great difficulty in making an approximate estimate.

The average annual earnings of a married ploughman in 1892 appear from the Reports of the Labour Commissioners to have been 49*l.* Mr. Rutherford is of opinion that unmarried men and day labourers earn very nearly the same amount as this; but where exact estimates are given of earnings of both classes, it generally appears that the unmarried in kitchen or bothy, fit for all ordinary farm work, earn 2*l.* to 4*l.* less than the married.

TABLE 4.—*Index Numbers, showing General Change*

	1760-70.	'70-80.	'80-90.	'90.	'94.	'96.	'98.	1800.	'09.	'10.	'12.	'13.	'14.
1. S.W.*	18	27	30	32	37	—	—	48	—	80	71	—	(64)
2. S. Central	—	—	—	30	35	—	—	—	—	64	—	—	—
3. S.E.	(15)	(18)	(20)	32	35	—	36	—	—	64	—	59	—
4. Lothians.........	(20)	·25	—	32	34	—	—	(65)	50	63	—	64	(42)
5. Mid E.	(16)	(18)	28	28	31	(25)	—	—	50	—	—	53	50
6. ,, W.	(18)	—	(30)	31	36	—	—	52	64	60	80	—	52
7. E. Central	(16)	17	(22)	27	33	—	—	—	—	54	64	60	57
8. N.E.	(20)	—	(26)	26	30	—	—	—	—	58	—	—	48
9. W. Central....	—	—	—	29	33	—	—	—	—	53	—	—	—
10. N.	—	—	—·	20	21	—	—	—	—	47	—	—	—

* For counties included in

Taking the average difference as 2*l.*, this discrepancy will not reduce the 49*l.* above stated by so much as 1*l.*, unless the un-married are as numerous as the married. We may, therefore, perhaps state the average wage as lying between 48*l.* and 50*l.*, and expect it to be nearer the lower than the higher limit.

Note that if the probable error of the wage stated for a single county is 1*d.* a day, or 2*l.* a year, a reasonable supposition as regards day labourers and married ploughmen respectively, the probable error of the average of twenty-five counties does not differ much from 1*d.* or 2*l.*, each divided by $\sqrt{25}$. That is the probable error in the average is about 1 per cent. This error is, however, in addition to any errors of omission, common to all the counties.

III.—*A Note on some Statistics regarding China.*
By E. H. PARKER.

THE tables following show something of the progress of China during a period of nearly two centuries and a half. This period commences with the accession to power of the reigning Manchu dynasty, and concludes with the time when, owing to the Allied war, finance became disorganised and the maritime customs were established by foreign powers.

There is a book called the *Tung-hwa Luh*, or *Eastern Beauty Record*—a high-flown expression practically equivalent to "the official acts of the Sublime Porte," if we can imagine the Manchus to be a kind of Turk. At the end of each chapter or each year of these seventy volumes is given the population and revenue for that year; and I may add that not only have I copied out these economical details, but before doing so I have read through each chapter, so that any casual remarks bearing upon population and

of Wages of all Classes in Groups of Counties.

'20.	'27.	'34.	'35.	'39.	'41.	'43.	'46.	'51.	'55.	'58.	'60.	'64.	'67-70.	'78.	'81.	'83.	'92.
—	—	—	—	51	(58)	50	—	54	—	—	63	—	85	—	92	—	100
—	—	42	—	56	—	—	—	—	—	—	81	—	92	—	101	—	100
(55)	(31)	(35)	—	51	—	—	—	65	(52)	—	75	(70)	82	(120)	102	—	100
—	—	—	—	51	51	48	—	60	—	(78)	65	—	75	—	90	—	100
—	—	(37)	49	52	(61)	—	—	—	—	—	69	—	71	(90)	—	—	100
(64)	—	—	(49)	50	—	—	—	—	(40)	—	74	—	68	104	96	—	100
—	—	—	—	47	—	—	(50)	58	—	—	66	73	73	(117)	93	100	100
—	—	—	—	42	—	—	—	(62)	—	—	73	(90)	72	114	92	—	100
—	—	—	—	50	—	—	—	—	—	—	81	—	71	(112)	(94)	—	100
—	—	—	—	43	—	—	—	—	—	—	67	—	83	(106)	—	—	100

these groups, see Table 1.

revenue have not passed unnoticed. This has been the work of three years.

These data will, I think, be of great value for purposes of reference, and I shall hope in the future to be able to add to them analogous tables for earlier dynasties, not yet fully examined.

It will be noticed that from 1651 to 1734 the Chinese government was satisfied with the old-fashioned computation of households, which (evidence clearly shows) must be multiplied by six, and not five as computed by Amiot, in order to obtain the number of souls. At first count was kept only of sums derived from the salt tax and land tax, but afterwards the amount of grain and fodder stored in the government granaries was chronicled every year, as also the quantity of tea produced, and the number of strings of copper coins struck off; and all these returns I possess. I do not enter here into the various points suggested by a consideration of these branches of revenue, nor do I define what may be precisely intended and covered by these computations. My only object at present is to get the more important of these figures on permanent record, so that they may be available and convenient for reference when the time shall come to deal with each item separately. Meanwhile I may perhaps be permitted to allude to a scheme of revenue and expenditure, in tables, which covers the period subsequent to the Allied war, and which has recently been published in the *Otia Merseiana* (Victoria University). An account (preliminary) of the modern salt gabelle will be found in the *British Economic Association's Journal* for this quarter, and a detailed description of military and arsenal expenditure in the *United Service Magazine* for September, 1898, to February, 1899. I have treated of slavery in the *New Century Magazine* for 1897. I refer to these facts because Chinese population records are inextricably bound up with questions of freemen, slaves, military exemptions, penal colonies, and similar matters.

[000's omitted.]

	Taxed Population. Families.	Land* (Measures of 16 English Acres).	Land Tax (Ounces of Silver).
1651............	10,633,	2,909,	21,100,
'52............	14,484,	4,034,	21,261,
'53............	13,917,	3,888,	21,287,
'54............	14,057,	3,897,	21,686,
'55............	14,034,	3,878,	22,006,
'56............	15,413,	4,782,	22,090,
'57............	18,612,	4,960,	24,366,
'58............	18,633,	4,989,	24,585,
'59............	19,009,	5,142,	24,586,
1660............	19,088,	5,194,	25,664,
'61............	19,138,	5,265,	25,724,
'62............	19,203,	5,311,	25,769,
'63............	19,284,	5,350,	25,798,
'64............	19,302,	5,359,	25,808,
'65............	19,312,	5,381,	(*sic*) 21,817,
'66............	19,353,	5,395,	25,831,
'67............	19,365,	5,411,	25,841,
'68............	19,366,	5,410,	25,839,
'69............	No record; for no apparent reason.		
1670............	19,396,	5,455,	25,897,
'71............	19,408,	5,459,	25,909,
'72............	19,432,	5,491,	26,052,
'73............	19,394,	5,416,	25,064,
'74............	17,246,	5,309,	24,211,
'75............	16,076,	5,073,	20,631,
'76............	16,037,	4,864,	20,213,
'77............	16,216,	4,983,	21,126,
'78............	16,846,	5,065,	21,953,
'79............	16,914,	5,136,	22,134,
1680............	17,095,	5,228,	22,156,
'81............	17,235,	5,315,	22,184,
'82............	19,433,	5,524,	26,332,
'83............	19,521,	5,616,	26,391,
'84............	20,341,	5,892,	27,211,
'85............	20,342,	5,892,	27,211,
'86............	20,342,	5,903,	27,240,
'87............	20,349,	5,904,	27,262,
'88............	20,349,	5,904,	27,262,
'89............	20,364,	5,932,	27,371,
1690............	20,364,	5,933,	27,375,
'91............	20,364,	5,933,	27,375,
'92............	20,366,	5,974,	27,386,
'93............	20,366,	5,973,	27,386,
'94............	20,371,	5,965,	27,391,
'95............	20,371,	5,975,	27,390,
'96............	20,410,	5,986,	27,397,
'97............	(*sic*) 22,411,	5,986,	27,398,
'98............	20,411,	5,987,	27,399,
'99............	20,411,	5,987,	27,400,
1700............	20,411,	5,987,	27,291,
'01............	20,411,	5,987,	27,391,
'02............	20,411,	5,987,	27,391,
'03............	20,411,	5,987,	26,891,

* *I.e.*, taxable first class units. From 2 to 10 acres of inferior land count as 1 acre of first class.

	Taxed Population. Families.		Land (Measures of 16 English Acres).	Land Tax (Ounces of Silver).
	A	B	C	D
1704..........		20,412,	5,987,	27,411,
'05............		20,413,	5,989,	27,411,
'06............		20,413,	5,989,	27,411,
'07............		20,413,	5,989,	27,421,
'08............		21,621,	6,211,	27,805,
'09......... {	Three following years three		all provinces once remitted; spread (in batches) over three years.	
1710..........		23,311,	6,631,	29,203,
'11..........		24,621,	6,930,	29,905,
'12..........		24,624,	6,930,	(sic) 19,508,
'13........ {	Free 60,455 }	23,587,	6,931,	21,090,
'14........ {	Free 119,022 }	24,623,	6,951,	29,893,
'15........ {	Free 173,563 }	24,623,	(sic) 6,591,	29,695,
'16............			No returns.	
'17........ {	Free 210,025 }	24,722,	7,251,	29,724,
'18........ {	Free 251,025 }	24,722,	7,251,	29,995,
'19........ {	Free 298,545 }	24,722,	7,268,	28,155,
1720........ {	Free 309,545 }	24,720,	7,268,	29,832,
'21........ {	Free 467,850 }	29,148, (sic)	7,356,	28,791,
	Death of emperor:		no returns given in	the annals.
'22........ {	Free 454,320 }	25,309,	8,511,	29,477,
'23........ {	Free 408,553 }	25,325,	8,902,	30,224,
'24........ {	Free 601,838 }	25,510,	8,906,	30,447,
'25............			No returns.	
'26........ {	Free 811,224 }	25,580,	8,969,	29,546,
'27........ {	Free 852,877 }	25,656,	8,636,	29,815,
'28........ {	Free 860,710 }	25,661,	8,653,	29,500,
'29........ {	Free 859,620 }	25,800,	No	record.
1730........ {	Free 851,959 }	25,480,	8,782,	29,787,
'31........ {	Free 861,477 }	25,441,	8,786,	29,798,
'32........ {	Free 922,191 }	25,443,	8,814,	30,089,
'33........ {	Free 936,486 }	25,412,	8,890,	29,872,
'34........ {	Free 937,530 }	26,418,	8,901,	29,902,

Note.—In Col. A the full figures are given.
In Cols. B, C, and D, 000's are omitted.

[000's omitted.]

Year.	Total Population.	Grain Stored. Peculs ($133\frac{1}{3}$ lbs.).	
1735....	—	—	Dzungar war ; no record.
'36....	—	—	,, ,,
'37....	—	—	,, ,,
'38....	—	—	,, ,,
'39....	—	—	,, ,,
1740....	—	—	,, ,,
'41....	143,412,	31,722,	
'42....	159,802,	29,621,	
'43....	164,454,	29,621,	Taxpayers, according to Father Amiot, 28,516; ∴ 142,582, at 5, + 2,470 exempt, + 50,000, thieves, &c.
'44....	166,809,	32,089,	
'45....	169,922,	35,587,	
'46....	171,897,	25,055,	During war with Tibetan tribes.
'47....	—	—	,, ,, No record.
'48....	—	—	,, ,, ,,
'49....	177,495,	32,200,	
1750....	179,539,	33,191,	
'51...	181,811,	27,341,	
'52....	—	—	No return.
'53....	183,378,	29,021,	
'54....	184,504,	31,111,	
'55...	185,613,	32,966,	
'56...	186,616,	30,191,	
'57...	185,348,*	—	No return (v. 1783).
'58....	191,673,	29,959,	
'59....	194,792,	31,785,	
1760....	196,838,	31,380,	Allenstein confirms.
'61....	198,214,	34,723,	,, ,, 198,214,.
'62....	200,472,	34,093,	
'63....	204,210,	34,044,	
'64....	205,591,	34,699,	
'65....	—	—	No return.
'66....	208,096,	36,962,	
'67....	209,840,	38,619,	
'68....	—	—	No return.
'69....	212,023,	37,580,	
1770....	213,613,	35,793,	
'71....	214,600,	38,097,	
'72....	216,467,	37,872,	
'73....	218,743,	41,249,	
'74....	221,027,	(sic) 861,	Possibly because of the Tibetan campaign.
'75....	264,561,	30,958,	
'76....	268,238,	46,303,	
'77....	—	—	No return ; perhaps because 1778-90 was a remission, as before.
'78....	242,966,	39,458,	
'79....	275,043,	28,873,	

* Obtained from other sources.

[000's omitted.]

Year.	Total Population.	Grain Stored. Peculs (133⅓ lbs.).	
1780....	—	—	No return.
'81....	279,816,	40,220,	
'82....	281,823,	41,739,	Sachanoff makes 77,685, less than 1812.
'83....	284,034,	41,350,	„　　says 98,685, over 1757.
'84....	286,331,	39,107,	
'85....	288,864,	39,176,	
'86....	291,102,	37,464,	
'87....	292,429,	37,557,	
'88....	294,852,	42,494,	
'89....	—	—	No return.
1790....	301,487,	45,487,	
'91....	304,354,	45,753,	
'92....	307,467,	45,644,	1793.　Emperor says, "13 times that of 1710. 1 man feeds 10."
'93....	310,497,	44,186,	
'94....	313,282,	45,003,	
'95....	296,969,	39,753,	Miao savages and secret Society rebellions.
'96....	275,662,	37,207,	Population excluding Hu Kwang and part of Fukien, for which former returns used.
'97....	271,334,	31,336,	
'98....	290,983,	30,758,	
'99....	293,283,	31,381,	
1800....	295,237,	29,575,	
'01....	297,502,	30,484,	
'02....	299,750,	31,184,	
'03....	302,251,	30,548,	
'04....	304,461,	29,706,	
'05....	332,181,	29,412,	Increase 27,720, noted by Emperor.
'06....	335,309,	28,113,	
'07....	338,062,	30,218,	
'08....	350,292,	30,484,	
'09....	352,900,	33,529,	
1810....	(*sic*) 345,717,	31,443,	River floods, perhaps, or, possibly, error.
'11....	358,510,	33,391,	
'12	333,701,	33,589,	Perhaps due to river floods.
'13....	336,452,	33,704,	„　　and rebellions.
'14....	316,575,	30,803,	
'15....	326,575,	30,803,	
'16....	328,815,	32,651,	
'17....	331,330,	34,098,	
'18....	348,820,	35,563,	
'19....	(*sic*) 301,261,	36,774,	Possibly floods.
1820....	—	—	No return.
'21....	355,540,	35,120,	
'22....	372,458,	35,355,	
'23....	375,153,	34,897,	
'24....	374,601,	32,884,	
'25....	379,885,	32,610,	
'26....	—	—	Jehangir war going on.
'27....	383,696,	31,553,	
'28....	386,532,	32,982,	
'29....	390,501,	33,806,	

[000's omitted.]

Year.	Total Population.	Grain Stored. Peculs ($133\frac{1}{3}$ lbs.).	
1830....	394,785,	34,054,	
'31....	—	—	
'32....	397,133,	32,235,	
'33....	398,942,	30,556,	
'34....	—	—	
'35....	401,767,	30,532,	
'36....	404,901,	29,676,	Minus Fu Kien and Hu Nan old returns.
'37....	405,923,	30,350,	
'38....	409,039,	30,829,	
'39....	410,851,	31,615, {	Minus Hu Nan, Fu Kien, and part of Formosa, old returns.
1840....	412,815,	32,370,	
'41....	413,457,	32,062,	
'42....	414,687,	32,149,	Sacharoff makes 53,994, over 1812.
'43....	417,239,	32,018,	
'44....	419,441,	(sic)22,380,	
'45....	421,343,	32,301,	
'46....	421,121,	32,493,	
'47....	424,939,	31,503,	
'48....	426,737,	32,274,	
'49....	412,987,	25,727,	
1850....	414,493,	27,492,	
'51....	432,164,	27,112,	
'52....	334,403,	24,223, {	Kiang Su, Hu Peh, and Hu Nan returns not in.
'53....	297,627,	20,684, {	Kiang Su, Hu Peh, and Hu Nan returns not in.
'54....	298,153,	18,104, {	Kiang Su, An Hwei, Hu Peh, Hu Nan, Fu Kien, Kwang Tung, and Kwang Si not in.
'55....	293,740,	15,205, {	Kiang Su, An Hwei, Hu Peh, and Kwei Chou not in.
'56....	275,118,	13,436, {	Kiang Su, An Hwei, Hu Peh, and Kwei Chou not in.
'57....	240,702,	8,276, {	Kiang Su, An Hwei, Fu Kien, Hu Peh, Hu Nan, Ho Nan, Kwang Tung, Kwang Si, Yün Nan, and Kwei Chou not in.
'58....	293,888,	11,415, {	Chih Li, Kiang Su, An Hwei, Fu Kien, Hu Peh, Hu Nan, Kwang Tung, Kwang Si, Yün Nan, and Kwei Chou not in.
'59....	291,149,	9,980,	
1860....	260,925,	5,232,	

IV.—*Reply to Criticisms on Paper, "Deaths in Child-birth in New South Wales."*[36]   By T. A. COGHLAN, Government Statistician of New South Wales.

MRS. GARRETT-ANDERSON says: "Take, for instance, the figures in the second table. If one added up the mortality at all the different ages, an average mortality of 1 in 121 was the result. That at the present time was a terribly high mortality, and deductions drawn from it were useless; they were misleading. She had recently taken the figures from eight large lying-in charities in London, and added to them those of the Rotunda in Dublin, in order to arrive at the present mortality in childbirth, and the ratio of deaths to deliveries was much more like 1 in 600 or 650."

The third table is evidently referred to in the above extract, the second table referring to the probability of death at each confinement. From Table III, which gives the number of *first* confinements of women at each age with the corresponding deaths, we find, as a result " of adding up the mortality at all the different ages," that with 27,295 confinements there were 233 deaths. The ratio thus obtained of deaths to confinements would be 1 in 117, a result, if importance could be attached to it, even worse than that obtained by Mrs. Garrett-Anderson. But this result refers only to first confinements, the mortality in which is shown to be higher than at any subsequent confinement up to the ninth. The ratio 1 in 117 is therefore but the risk of death at first confinement if age be left out of account. The bare ratio of deaths to confinements amongst married women can be obtained from Table I; that is, as 714 is to 105,749, or 1 death in every 148 confinements. Amongst 9,920 confinements of unmarried women there were 99 deaths. This ratio therefore is 1 in 100. Out of the total confinements, married and unmarried women together, 115,669, there were 813 deaths, or one death in every 142 confinements. Although this mortality is much lower than that stated by Mrs. Garrett-Anderson (1 in 121), it does not nearly approach the estimate arrived at by that lady, viz., 1 in 600 or 650. Her figures are apparently only estimates. But if the statistics of the whole country were available, it is certain that a much heavier mortality would have been shown. It may be that New South Wales stands in need of some apostles of antiseptic midwifery, but the facts are as stated. Some exception might be taken to the inclusion of abortions and miscarriages as risks incident to confinement—to the former especially. There were during the years the paper deals with 34 cases of abortion. If these be subtracted from the number of deaths in all confinements, 813, we obtain 779 deaths in 115,635 confinements, or 1 death in 148 confinements. Miscarriage, however, cannot but be regarded as one of the risks attending childbirth, and they should not be excluded. Even if they were, the result is 1 death in every 164 confinements. This mortality,

[36] For the original paper and the discussion thereon, see *Journal of the Royal Statistical Society*, vol. lxi, pp. 518—533.

however, is about four times that estimated by Mrs. Garrett-Anderson.

I would like to point out, in reply to Mr. E. W. Brabrook's criticisms, that the table relating to the ages of husband and wife has nothing whatever to do with the deaths in childbirth. It was used in connection with the calculation of the probable number of children born to women marrying at various ages. In New South Wales the average age of the husband is nearly five years more than that of the wife. A previous investigation has revealed the probability of a birth within twelve months to a woman of any age. The total number of children that will be born to a woman will be the sum of these various annual probabilities, from the age of marriage upwards, multiplied by the various annual probabilities of the joint survivorship of the husband and wife, assuming the husband to be five years older than the wife. In this way the table showing the number of children to a woman marrying at any age was computed. Mr. Brabrook states that an average 7·22 children to a woman marrying at age 20 is beyond general experience. The New South Wales statistics show amongst other particulars the death of a married woman, the age at marriage, and the number of children subsequently born. During the five years 1893-97 there died 1,265 women who were married at the age of 20, and that these women had 7,731 children born to them. This gives an average of 6·11 children per woman. In a rapidly increasing community like New South Wales, this method of determining the average yields too small a result, for the longer lived and generally larger familied survivors of a small community are averaged with the shorter lived and smaller families of the present larger community. Viewed in this light, 7·22 does not in any way appear an abnormally large number. Mr. Brabrook further says, "the author of the paper appeared to have fallen into an error similar to that of treating the years of expectation of life as the terms of an annuity. The author had taken the average expectation of confinements of a woman aged 30 at marriage, viz., 3·49, and had multiplied together the probability of surviving each such confinement separately, in order to get the figure representing the probability of the woman surviving every confinement; whereas, he should have taken the totals for all the confinements observed, and derived his average from them in the manner common in tables of mortality, which would probably have produced a different result." It has been shown in the table that to a woman marrying at age 30, there will on an average be 3·49 children born, or 3·49 confinements to pass through. The separate risks at each of these confinements are known, and consequently the probability of surviving each confinement. The probability that she will survive all these confinements is unquestionably the product of the probabilities of her surviving each confinement. Thus, to a woman now aged 30, the probability of her surviving one year (New South Wales experience) = 0·9937; of her surviving the second year, having survived the first, = 0·9934; of her surviving the third year, having survived the two previous years = 0·9930. Now, being aged 30, that she will survive three years is the product of these

three separate probabilities $= 0.9937 \times 0.9934 \times 0.9930 = 0.9805$. Now, in the case of the confinements, a woman marrying at the age of 30 has 3.49 confinements on the average; there is a specific probability of her surviving her first confinement; having survived that, there is a specific probability of her surviving the next; and so on. That she will survive all the confinements is clearly the product of the separate probabilities. There really would seem to be no parallelism between the methods adopted and that of treating a life annuity as the value of an annuity—certain for the expectation of life, as hinted by Mr. Brabrook.

Exception was taken by Dr. Hingston Fox to the adjustment of the figure representing the risk at second confinement, as he states the New South Wales unadjusted figures agree with his own. Thus he was in a position to judge, and his criticism is justifiable. Taking the results of the year 1897, and combining them with the previous years (those under review), the risks at consecutive confinements were as follows : first confinement, $0.008,917$; second confinement, $0.004,557$; third confinement, $0.005,982$; fourth confinement, $0.005,641$. This confirms Dr. Duncan's statement, that the risk at the second confinement is only about one-half the risk at the first. This fact would now appear to be firmly established, in view of the first investigation, and the results of this colony for the year 1897. It was thought, however, when curving, that the fact of the risk in the first confinement being higher than that of subsequent confinements up to the ninth, while the fourth was lower than the third or fifth, that the minimum risk was at the fourth. But in view of the corroboration referred to above, it would now appear conclusively that the minimum is at the second, closely followed, however, by the third and fourth confinements. Had the corroborative data been available at the time, the curve would have been shown as indicated by Dr. Hingston Fox.

With regard to Mr. G. Udny Yule's suggestion that the sex of the child might possibly account for some of the difference between risk at confinement for married and unmarried women, the records do not show whether the death of the mother occurred at the birth of a male or female infant. But this could not materially contribute towards the difference in the death-rates between the married and unmarried women. As regards the sex of the offspring, twenty-two years' experience gives to the married 51.27 males out of 100 births, and to the unmarried 50.95 out of 100. The most probable cause is that stated by Dr. Hingston Fox—that distress of mind connected with illegitimate birth brings added danger to the life of the mother.

V.—*Commercial History and Review of* 1898.

THE following is taken from the supplement to the *Economist* of 18th February, 1899, in continuation of similar extracts for previous years :—

" The gradual improvement in trade that had been in progress for some two or three years previously became in 1898 so much

more marked, and gained such a greater impetus, as to constitute that year one of real industrial prosperity. It is true that in it, as in the immediately preceding year, our foreign trade proved somewhat disappointing. There was, as will be seen from the following statement, a considerable expansion of our imports, but our exports of home products, instead of showing any corresponding growth, underwent a slight contraction. Here is how the comparison with 1897 works out :—

	1898.	1897.	Increase or Decrease.	
			Amount.	Per Cent.
	£	£	£	
Imports	470,604,000	451,029,000	+ 19,575,000	4·34
Exports of home products	233,391,000	234,220,000	— 829,000	0·35
Re-exports of foreign and colonial merchandise	60,619,000	59,954,000	+ 665,000	1·11
Total trade................	764,614,000	745,203,000	+ 19,411,000	2·60

" And the movements thus shown in the value of our foreign trade correspond very closely with those in its volume. How the comparison as to quantities is worked out is shown in Appendix A. Here it is sufficient to give the results, which are as follows :—

Volume of Our Foreign Trade. Increase or Decrease per Cent. as compared with previous Years.

	Imports Retained for Home Consumption.	Exports of Home Produce.	Imports and Exports.
	Per cnt.	Per cnt.	Per cnt.
1898....................	+ 4·59	— 0·14	+ 2·82
'97....................	+ 1·64	— 1·29	+ 0·51
'96....................	+ 6·06	+ 4·87	+ 5·50
'95....................	+ 5·54	+ 8·57	+ 6·66
'94....................	+ 9·95	+ 3·35	+ 7·39
'93....................	— 1·42	— 2·10	— 1·68
'92....................	+ 0·33	— 3·43	— 1·17

" The articles that mainly contributed to swell the volume of our imports last year were foodstuffs and raw cotton, and though there may in some quarters be a disposition to cavil at the growth in the former, it cannot be other than a matter for congratulation that owing to the abundance of the American cotton crop, our manufacturers had the command of largely increased supplies at low prices, a condition of things which did much to stimulate the improvement in our cotton industries, which is one of the most gratifying features of last year's trade. And when we turn to the exports, a little examination suffices to show that the record for the year is by no means so unsatisfactory as it appears at a first glance. If we take not the aggregates for the whole year,

but those for the first and second halves separately, we get the following statement :—

Imports.

| | 1898. | 1897. | Increase or Decrease. | |
			Amount.	Per Cent.
	£	£	£	
First half year	235,996,000	225,245,000	+ 10,751,000	4·77
Second ,, ...	234,608,000	225,784,000	+ 8,824,000	3·91
	470,604,000	451,029,000	+ 19,575,000	4·34

Exports of Home Products.

| | 1898. | 1897. | Increase or Decrease. | |
			Amount.	Per Cent.
	£	£	£	
First half year	112,508,000	117,410,000	— 4,902,000	4·17
Second ,, ...	120,883,000	116,810,000	+ 4,073,000	3·49
	233,391,000	234,220,000	— 829,000	0·35

" From this it will be seen that the imports continued to increase during the second as well as the first half of the year, but at a slightly lower rate. There was, however, no such continuity in the exports. Whereas in the first half of the year these showed, as compared with the like period of 1897, a decrease of 4·17 per cent., in the second half, instead of a further falling off, there was an increase of 3·49 per cent. It is obvious, therefore, that in the latter part of the year there was a distinct change for the better, which, it is satisfactory to note, has continued into 1899, and the causes for which are not far to seek. As regards their influence upon our trade it would be easy to overrate the importance of the political complications of the year. No doubt the war between the United States and Spain, and, later on, the strained relations between this country and France resulting from the Fashoda affair, did prejudicially affect business. In both cases, however, the check was only temporary, and even while it lasted it was not very pronounced. But whereas during the first half of the year our exports to the United States fell short by about 6,500,000*l.* of those in the corresponding period of 1897, in the second half they showed a slight increase. This was, of course, due mainly to the operation of the Dingley tariff, which led to large imports into the States and a great accumulation of stocks there in the early part of 1897. Even in the first six months of last year our exports to foreign countries, other than the United States, were in the aggregate somewhat larger than in the like period of 1897, and there was also a noteworthy augmentation of our exports to India, which

had begun to recover with wonderful rapidity from the effects of the famine. But the gain in these directions was much more than off-set by the relative shrinkage of our trade with the United States, and the result was a net falling off of not far short of 5,000,000*l.* in the value of the half-year's shipments. In the second half of the year, however, the United States took from us more of our products than in the latter part of 1897, and there being a continued expansion in other directions, notably India, Russia, Germany, and most of the South American States, the loss during the first six months was nearly recouped by the gain in the second. Something also must be attributed to the bad effect of the strike in South Wales upon our export trade in the earlier part of 1898; but the main point is that throughout the whole of the year we were gaining ground, if allowance be made for the exceptional falling off in our shipments to the United States, due mainly to the disturbing influence of the Dingley tariff. And as that influence has now probably produced its full effect, there seems good reason to hope that the expansion of the volume of our exports which characterised the latter part of 1898 will continue, and make even more decided progress.

" In connection with our foreign trade, there has of late been a good deal of discussion with regard to the large excess in the recorded value of our imports as compared with our exports. That is an old subject of controversy which has been hotly debated at intervals during the past twenty years or so, without, however, leading to any agreement, and the recent discussion of it has not tended to any greater enlightenment than those which have preceded it. But while carping at their opponents' figures, those who maintain that we are eating up our capital, carefully refrain from adducing any evidence on their own side. Yet surely the burden of proof lies upon them. If you declare that an apparently hale and sound man is suffering from a wasting disease, surely it is for you to show some justification for the assertion. To content yourself with calling upon him to disprove your statement, and to maintain that until he does so to your satisfaction you must be held to be right, would, of course, be considered absurd. So with regard to this discussion. Those who maintain that for years we have been drawing upon our capital to pay for our imports, must be prepared to adduce some evidence of national impoverishment. Of that, however, they can give none, while there is much and cogent evidence to the contrary. There is no better measure of the national wealth than the death duties, and not to go far enough back to let comparison be affected by changes in the method of levying those duties, we find that the net amount of property on which estate duty was paid rose from 219,489,000*l.* in 1895-96 to 248,690,000*l.* in 1897-98. So with the income-tax, the gross assessments under Schedules D and E rose from 413,507,000*l.* in 1892-93 to 429,253,000*l.* in 1896-97 (that being the latest year for which returns have been published), notwithstanding that in the interval there had been certain expansions in the limits of exemption. Then, again, we have seen the deposits in our savings and

other banks mounting continuously upwards by many millions a year. The revenue has been advancing by leaps and bounds, and many similar evidences of a growth of wealth and well-being might be cited. Yet in spite of them all we are asked to believe that because of an adverse balance of trade, we have been forced to consume and eat into our capital. When those who advance that theory are able to give proofs in support of it, it will be time enough to give it serious consideration. Meanwhile the evidence all goes to show that while we have been using part of our augmented resources to procure for ourselves larger supplies of the luxuries, comforts, and necessaries of life, we have nevertheless been living well within our means, and adding year by year to the national wealth.

" Turning now from our foreign to our home trade, the testimony of most of the reports upon our various industries, which we publish elsewhere, is that 1898 was a year of exceptional activity, upon which our manufacturers can look back with satisfaction, not only as regards the volume of business done, but also the profits realised. To this rule there are certain important exceptions. Throughout the year our woollen industries were more or less depressed, in consequence of the great falling off in the American demand for their products, and our linen industries suffered from the same cause. On the other hand, however, the output of our shipbuilding yards and our production of pig-iron exceeded all previous records, nearly all branches of the metal and engineering trades were working at high pressure, and our great cotton industry enjoyed a condition of full and profitable employment to which it had for many long years been a stranger. And, passing from the particular to the general, we have the evidence of our railway returns as to an all-round expansion of trade. The traffic receipts of the fifteen chief English railway companies will be found summarised in the appendix, and these compare with the totals for the previous year, thus :—

	Passengers and Parcels.		Merchandise.		Minerals.	
	1898.	1897.	1898.	1897.	1898.	1897.
	£	£	£	£	£	£
First six months	14,837,300	14,474,600	10,589,100	10,266,800	7,382,300	7,125,900
Second ,, ...	18,039,200	17,334,600	11,289,600	10,880,800	7,813,000	7,641,300
Total for year	32,876,500	31,809,200	21,878,700	21,147,600	15,195,300	14,767,200
Increase first six months	362,700 = 2·5 per cnt.		322,300 = 3·1 per cnt.		256,400 = 3·6 per cnt.	
Increase second six months	704,600 = 4·1 ,,		408,800 = 3·8 ,,		171,700 = 2·3 ,,	
Total increase for year	1,067,300 = 3·4 per cnt.		731,100 = 3·5 per cnt.		428,100 = 2·9 per cnt.	

" It will be observed that as regards passenger and merchandise traffic the gain in the second half of the year was greater than in the first, but that although the resumption of work by the Welsh collieries might have been expected to swell the receipts during the latter part of the year, these did not expand so much in the second as they had done in the first half. Of this the explanation probably is that during the strike in Wales the coal supplies, usually derived thence, had to be obtained from other and more distant quarters, and that, consequently, the traffic yielded more revenue to the railways. But however that may be, the growth in railway traffic stands as an incontrovertible evidence of an augmentation of the volume of our trade, and principally of our home trade. And similar evidence is afforded by the returns of the London and Provincial Bankers' Clearing Houses, which, when compared with those for 1897, show increases as follows :—

	1898.	1897.	Increase or Decrease.	
			Amount.	Per Cent.
	£	£	£	
London Clearing House (exclusive of Stock Exchange and Consols pay days)	6,462,583,000	6,014,989,000	+ 417,594,000	7·44
Manchester	202,972,000	193,005,000	+ 9,069,000	4·67
Liverpool	128,961,000	122,110,000	+ 6,851,000	5·61
Birmingham.....................	55,861,000	56,714,000	— 853,000	1·55
Newcastle	66,204,000	60,254,000	+ 5,950,000	9·87
Bristol	26,527,000	25,746,000	+ 781,000	3·03

"That the Birmingham returns should show a decrease as compared with 1897 is not surprising in view of the collapse in the cycle trade, and the exposure of the rottenness of the methods by which it had been financed. At all other centres, however, there was a substantial increase in the clearings, and, consequently, it is to be inferred, of the commercial transactions which gave rise to them.

" As an indication of the condition of trade, no statistics are more valuable than those published by the Labour Department of the Board of Trade, the collection of which has been much improved of late years, and which are issued with commendable promptitude. And as regards the employment of skilled labour, these show that 1898 was an exceptionally good year. The proportion of the members of trades unions reporting to the Department who were unemployed in 1898 was only 3 per cent., as compared with 3·5 per cent. in 1897, and an average of 5·2 per cent. for the seven years ending 1898. It is stated, too, that the percentage for last year would have been even smaller than 3 per cent. had it not been that the shipbuilding, engineering, and metal trades continued to be affected during the early part of the year by the engineering dispute. Nor was it only that fuller employment

was obtained by our industrial classes ; there was also an upward
movement in their rates of wages. The following statement shows
the number of workpeople affected by changes of wages of which
the Labour Department received intimation in each of the past
four years, and the net result of those changes :—

	1898.	1897.	1896.	1895.
Number of separate ⎰ By increases.... individuals affected ⎱ ,, decreases....	978,000 12,000	560,700 13,900	382,200 167,400	79,900 351,900
Computed net amount of increase or ⎱ decrease per week .... ⎰	+ 78,000*l.*	+ 31,507*l.*	+ 26,600*l.*	− 23,200*l.*
Average increase or decrease per ⎱ week of weekly wages per head ⎬ of these affected by the changes... ⎰	+ 1*s.* 6¾*d.*	+ 1*s.* −¾*d.*	+ 10½*d.*	− 1*s.* 3½*d.*

"Not only was the number of workpeople who participated
in the advances of wages in 1898 much greater than in the im-
mediately preceding years, but the average advance was much
more substantial. The rise was greatest in the building and coal
mining trades, but it extended over most of the branches of
industry reporting to the Department, with the one exception of
the textile trades, in which, on the average, a slight fall took
place, the improvement in the cotton industry having, as already
said, been offset by depression in the woollen, and, to a less degree,
in the linen industries. Altogether, however, the labour record
for 1898 is an exceedingly good one, and such as could only result
from a year of active and prosperous trade.

"Happily, in the increased prosperity of 1898, our great agri-
cultural industry had its share. All the principal cereal crops
were exceptionally productive, wheat yielding 34¾ bushels per
acre, or about 5½ bushels more that the average for the past ten
years ; barley, 35¾ bushels, against a ten years' average of 33
bushels ; and oats, 40¾ bushels, against a ten years' average of
38½ bushels. The harvest weather, moreover, being propitious,
the crops were gathered in in excellent condition, and, to crown all,
farmers were able to obtain satisfactory prices for their products.
The price of wheat has, of course, fallen greatly from the very
high level to which it was forced up during the great 'Leiter'
corner, and is considerably lower now than it was twelve months
ago, when the anticipated scarcity, of which Mr. Leiter sought to
take advantage, was influencing the market. Still, the average for
1898 is considerably above that of recent years, and higher prices
also have ruled for barley and oats. Further benefit accrued to
our agriculturists in 1898 from a record hay crop, and although,
owing to the prolonged drought during the latter part of the year,
cattle and dairy farmers suffered some loss, yet, taken all round,
1898 was to our agricultural community the best they have
experienced for many years. And, of course, the improvement in
their condition had a stimulating effect upon general trade.

Gazette Average Price of Wheat (per Imperial Quarter) in United Kingdom immediately after Harvest, 1892-98, and Total Average Gazette Price of Calendar Years.

Periods.	1898.		1897.		1896.		1895.		1894.		1893.		1892.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
After harvest	28	1	33	7	23	1	23	1	24	1	25	11	29	4
Calendar year average	34	—	30	2	26	2	23	1	22	10	26	4	30	3

Comparative Gazette Prices of Grain.

Week.	Wheat.						Barley.						Oats.					
	1898.		1897.		1896.		1898.		1897.		1896.		1898.		1897.		1896.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
July 30	36	11	28	10	23	8	24	2	17	10	19	7	20	11	19	—	14	10
Aug. 6	35	7	29	5	23	6	26	11	17	9	19	5	20	7	18	11	14	9
13	33	8	29	8	22	11	27	5	19	—	21	1	20	9	17	4	14	6
20	32	7	30	4	22	4	24	4	19	2	21	11	19	11	17	2	14	3
27	30	7	31	8	22	5	27	6	22	5	21	10	19	3	17	1	13	7
Sept. 3	28	1	33	7	23	1	27	8	25	11	21	11	18	11	17	—	13	11
10	26	10	33	1	23	9	27	9	27	4	23	4	17	10	17	3	14	1
17	25	7	33	10	24	—	26	10	28	11	24	8	16	10	17	—	14	6
24	25	5	33	11	24	4	26	9	29	7	26	3	17	1	16	8	14	1
Oct. 1	25	9	33	4	25	2	27	—	29	10	28	7	16	7	16	4	14	9
8	26	6	32	1	26	7	27	5	28	9	29	5	16	7	16	—	15	3
15	26	6	31	10	27	10	27	11	28	3	29	7	16	6	16	1	15	9
22	26	8	32	2	28	11	28	1	27	5	28	6	16	6	16	2	16	—
29	27	4	32	10	30	9	28	8	27	5	28	3	16	8	16	—	17	3
Nov. 5	28	4	33	5	31	6	28	6	26	10	27	5	17	2	16	5	17	6
12	28	4	34	—	31	9	28	7	26	3	27	3	17	5	16	3	17	7
19	28	1	33	11	32	11	28	5	26	2	26	8	17	2	16	5	17	7
26	27	9	33	8	33	4	28	4	25	9	26	9	17	1	16	8	17	7
Dec. 3	27	7	33	9	32	8	28	6	25	10	26	2	17	1	16	9	17	—
10	27	6	33	9	32	2	28	6	26	—	25	4	17	3	16	6	16	8
17	27	2	34	1	31	3	28	5	26	4	24	10	17	—	17	—	16	7
24	26	9	34	4	30	9	28	6	26	11	24	1	17	—	17	—	16	1
31	26	11	34	6	30	6	28	4	27	3	24	8	17	—	17	1	16	2

" It might have been expected that in a year of such active and expanding trade as was 1898, there would have been some appreciable upward movement in the prices of commodities. Although, however, the general level of prices was higher at the end of the year than at the beginning, the rise was very small indeed. The movement, as registered by our index number, was :—

	'Index Number,' representing the Combined Prices of Twenty-two Leading Commodities.		'Index Number,' representing the Combined Prices of Twenty-two Leading Commodities.
1st January, 1899	1918	1st January, 1896	1999
,, July, '98	1915	,, ,, '95	1923
, January, '98	1890	,, ,, '94	2082
,, July, '97	1885	,, ,, '93	2121
,, January, '97	1950	,, ,, '92	2133
,, July, '96	1947		

Thus, at the end of December, the index number was only about
1½ per cent. higher than it was at the beginning of January.   And
an examination of the movement in the prices of all our imports
and exports shows an even more trifling change.   That comparison
is made in Appendix A.   From it we find that while, on the
average, the prices of our imports last year were 0·24 per cent.
higher than in 1897, those of our exports were 0·26 lower, the net
result, taking imports and exports together, being a practical
stationariness in the price level.   How the movement last year
compared with that in previous years is shown in the following
statement:—

Prices of Imports and Exports.   Average Rise or Fall as compared with
previous Years.

	Imports Retained for Home Consumption.	Exports of Home Produce.	Imports and Exports.
	Per cent.	Per cent.	Per cent.
1898...................	+ 0·24	— 0·26	— 0·07
'97...................	— 0·12	— 1·11	— 0·51
'96...................	+ 1·85	+ 1·24	+ 1·63
'95...................	— 3·54	— 3·48	— 3·52
'94...................	— 7·91	— 4·27	— 6·54
'93...................	— 2·26	— 1·71	— 2·05
'92...................	— 4·17	— 4·91	— 4·46

   " But though the general level of prices did not alter much,
yet in certain classes of commodities wide variations occurred.
Thus, for instance, owing to higher prices our imports of all kinds
of corn cost us about 5,500,000*l*. more than they would have done
had we been able to buy them at the average prices of 1897;
while, on the other hand, we paid 5,600,000*l*. less for our imports
of raw cotton than they would have cost us had the prices of the
previous year been maintained.   And similarly in the exports.
We got about 2,850,000*l*. less for our exports of cotton goods and
yarn than they would have fetched at the prices of 1897, but
gained, owing to higher prices, about 1,260,000*l*. in our exports of
metals and machinery.   And when referring to metals, it may be
noted that one of the chief features in the price movement of the
year was a great rise in copper and tin, a rise which has made
more rapid progress in the current year, and which, while partly
due to our expansion of demand, is probably to a still greater
degree the result of market manipulations, and is certain to be
succeeded sooner or later by a sharp reaction.
   " While there is thus a good record to give of the past year, it
is not less satisfactory to note that the year upon which we have
now entered has, at all events, opened under favourable auspices.
The expansion of our export trade, which characterised the latter
part of 1898, has continued during the past month, and there are
reasons for hoping that it will make still further progress.   For

one thing, the decline in our trade with the United States, which, during 1898, off-set an increase in other directions, is not likely to be again experienced. The States can hardly buy less from us than they did last year; the probability rather is that they will buy more, for they have not now, as they had at the beginning of last year, large stocks accumulated in anticipation of the passing of the Dingley tariff to work off. In the condition, too, of some of our most important customers, such as India, Australia, and Canada, there is an improvement which should tend to an increase of our trade with them. Our commercial community have been roused to take a keener interest in the pushing of our foreign trade, and a spirit of enterprise is being shown in the exploitation of possible new markets, such as those of China, which, while it may lead in the end to the loss of a good deal of money too rashly embarked in unremunerative undertakings, yet helps for the time to give fuller employment to certain branches of industry. Whether the present fair prospect will be marred by political disturbances it is, of course, impossible to say; but, these apart, 1899 promises to prove a still better year industrially than was 1898.

" Political uneasiness, and recurring apprehensions of a drain of gold hence for the United States, were the main factors in determining the course of the money market during 1898. The year opened with the Bank rate at 3 per cent., and as the resources of the market were being reduced by the accumulation of government balances at the Bank, outside rates were held up much more closely than usual to the official minimum. That accumulation was due to the fact that while the revenue collection was going actively on, the Government was not making its customary disbursements, because work that would have had to be paid for was delayed by the engineers' strike. This state of things would in ordinary course have come to an end at the beginning of the April quarter, but just at that time it became apparent that war between the United States and Spain was almost inevitable. It was feared consequently that gold would be taken from this side for the States, and some small amounts were actually despatched. Consequently early in April the Bank moved its rate up to 4 per cent., and for a while the market refused to work under that figure. As, however, no large demands were made upon our stock of the metal, outside rates gradually slipped away, and the Bank having in the interval had its position strengthened by an influx of gold from abroad, it lowered its rate in the last week of May to $3\frac{1}{2}$ per cent., and a week later put it down to 3 per cent. Still the position of the Bank continued to improve, and the market, temporarily relieved of its apprehensions, underbid it more and more. At the end of June, therefore, the Bank rate was further reduced to $2\frac{1}{2}$ per cent., and a period of ease ensued that lasted until towards the end of September. Then about 1,000,000*l.* of gold was taken from the Bank for the States, and the official rate was put up to 3 per cent., that movement being followed pretty closely by the market. Just about that time, too, the Fashoda question began

to assume a critical phase, and the possibility of a war between this country and France had to be faced. Very properly in those circumstances the Bank thought it desirable to take measures to strengthen its position, and about the middle of October it raised its rate to 4 per cent., and at the same time took a good deal of money off the market so as to make the higher rate effective. And later on, just when a peaceful settlement of the Fashoda affair seemed assured, and the market was beginning to breathe more freely, such severe monetary stringency developed in Berlin that the Bank of Germany was compelled to raise its rate to 6 per cent. This, it was thought, would probably cause gold to be taken from the Bank of England; but, as it happened, large quantities of German bills were held here, and as these were not renewed at maturity, Berlin was not in a position to draw to any extent upon us. There could, however, be no question of lowering the Bank rate, which remained at 4 per cent. till the end of the year. The recurring spasms that affected the market during the year had the effect of making the outside rates for the greater part of the period keep much closer than usual to that of the Bank. And for this reason, as well as because the average discount rate for the year was higher, 1898 proved a decidedly profitable one to bankers, the margin of profit comparing with that of the previous three years thus :—

—	1895.	1896.	1897.	1898.
Changes in bank rate	none	three	six	four
	per cnt.	per cnt.	per cnt.	per cnt.
Highest bank rate	2	4	4	4
Lowest ,, ...	2	2	2	2½
	s. d.	£ *s. d.*	£ *s. d.*	£ *s. d.*
Average market rate of discount, best three months' bills	15 11	1 8 7	1 15 10	2 11 10
Average allowance on deposits	10 —	— 19 6	1 1 10	1 13 —
Margin of profit	5 11	— 9 . 1	— 14 —	— 18 10

" It may be added that, although the United States did not take much gold directly from us, they did during the year add very greatly to their stock of the metal. Their net imports of gold for the year amounted to over 27,000,000*l.*, and, adding to that their home production of the metal, which is estimated at 13,500,000*l.*, we have a total absorption of 40,500,000*l.* Of that, 13,000,000*l.* was added to the stocks of the metal in the New York Associated Banks, and 17,500,000*l.* to the stock in the United States Treasury. How rates in other European markets moved during the year is shown in the following table :—

European Rates of Discount per Cent. per Annum, 1898.

Cities.	Beginning of Months of 1898.												
	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Avge.
London.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
Bank rate	3	3	3	3	4	3½	2½	2½	2½	3	4	4	3·24
Open market	2¾	2 11/16	2 13/16	2⅞	3 9/16	1⅞	1	1½	1¾	2⅜	3 11/16	3 9/16	2·59
Paris.													
Bank rate	2	2	2	2	2	2	2	2	2	2	3	3	2·15
Open market	2	1 15/16	1¾	1⅞	1⅞	1¾	1⅞	1¾	1⅝	1⅞	2¾	3	2·07
Vienna.													
Bank rate	4	4	4	4	4	4	4	4	4	4	4½	5	4·16
Open market	3¾	3½	3⅜	3⅜	3⅞	3⅞	4	3¾	3⅞	4	4½	4¾	3·94
Berlin.													
Bank rate	5	4	3	3	4	4	4	4	4	4	5	6	4·26
Open market	3¾	2⅞	2⅝	2¾	3¼	3⅜	3½	3⅛	3⅜	4	4⅜	5	3·57
Frankfort.													
Bank rate	5	4	3	3	4	4	4	4	4	4	5	6	4·26
Open market	3¾	3	2¾	2⅝	3¼	3⅜	3⅜	3¼	3½	3⅞	4½	5¼	3·70
Amsterdam.													
Bank rate	3	3	3	3	3	3	3	3	2½	2½	2½	2½	2·83
Open market	2⅝	2⅞	2½	2⅝	3	2⅝	2½	2⅝	2⅝	2	2⅝	2⅜	2·49
Brussels.													
Bank rate	3	3	3	3	3	3	3	3	3	3	3	3	3·01
Open market	2	2	2	1⅞	2⅜	2¼	2¼	2¼	2	2¼	2⅞	2¾	2·31
Hamburg.													
Bank rate	5	4	3	3	4	4	4	4	4	4	5	6	4·26
Open market	3½	2⅞	2⅝	2¾	3¼	3⅜	3½	3¼	3¼	3⅞	4⅜	5⅛	3·63
St.Petersburg													
Bank rate	6	5½	5½	5½	5½	5½	5½	5½	5½	5½	5½	5½	5·53
Open market	5	5	4¾	4¾	4¾	5¼	5	4½	4	4	5½	5½	4·84

"The silver market in 1898 is thus reported upon by Messrs. Pixley and Abell:—

"'After the extreme variations which occurred in 1897, a range of 3 5/16*d.* in 1898 is comparatively small. For some two months the market was fairly steady. Then rumours of a prohibitive Indian import duty, together with the dislocation of business caused by a recurrence of the plague, led to a severe fall, and 25*d.* —which proved to be the lowest price of the year—was touched in March. With confidence somewhat restored shortly afterwards, India became a better buyer; but as each rise was answered by both New York sales and speculative bear transactions, no upward movement took place. India and China together purchased a large amount of Japanese silver, which is reported to aggregate three millions sterling. The marked difference in price which had so long existed between "spot" and "forward" silver gradually disappeared, and in April the rate differed by ⅛*d.* only. Later in the year even this discount was at times unnecessary, and on more than one occasion the quotations were the same. Paris required

large tenders during April, and later these became an important factor. The "bear" sales already alluded to clashed with large orders for Spanish coinage. These proved to be the feature of the year. Altogether about 4,000,000*l.* was purchased during the autumn, at rates up to 28⅜*d.* With the completion of the above, the market gradually fell away, although demands for India and Manila prevented any heavy decline. India, as a rule, was more often a buyer of forward delivery than of spot silver, especially so long as any discount attached to forward rates. In November, however, the war scare caused most Indian banks to re-sell their purchases rather than ship and pay war risks. There were no special continental demands outside those mentioned, although Russia should be noted as having bought steadily throughout the year.'

Monthly Fluctuations in Price of Bar Silver.

	1898.		1897.		1896.		1895.		1894.	
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
January	$26\frac{1}{8}$	$26\frac{1}{8}$	$29\frac{13}{16}$	$29\frac{11}{16}$	$30\frac{7}{8}$	$30\frac{1}{2}$	$27\frac{7}{16}$	$27\frac{3}{16}$	$31\frac{5}{8}$	$30\frac{1}{2}$
February........	$26\frac{1}{4}$	$25\frac{5}{8}$	$29\frac{3}{4}$	$29\frac{11}{16}$	$31\frac{9}{16}$	$30\frac{3}{4}$	$27\frac{11}{16}$	$27\frac{1}{4}$	$30\frac{11}{16}$	$27\frac{1}{2}$
March	$26\frac{1}{16}$	25	$29\frac{5}{8}$	$28\frac{5}{16}$	$31\frac{9}{16}$	$31\frac{1}{4}$	$29\frac{3}{4}$	$27\frac{5}{8}$	$27\frac{7}{8}$	27
April	$26\frac{5}{16}$	$25\frac{11}{16}$	$28\frac{1}{2}$	$28\frac{3}{16}$	$31\frac{9}{16}$	$30\frac{13}{16}$	$30\frac{7}{8}$	$29\frac{7}{8}$	$29\frac{7}{8}$	$29\frac{1}{2}$
May	$26\frac{1}{8}$	$25\frac{7}{8}$	$28\frac{3}{16}$	$27\frac{1}{2}$	$31\frac{1}{4}$	$30\frac{15}{16}$	$30\frac{7}{8}$	$30\frac{3}{16}$	$29\frac{1}{4}$	$28\frac{1}{16}$
June	$27\frac{1}{2}$	$26\frac{11}{16}$	$27\frac{3}{4}$	$27\frac{1}{2}$	$31\frac{9}{16}$	$31\frac{3}{16}$	$30\frac{11}{16}$	$30\frac{3}{16}$	$28\frac{15}{16}$	$28\frac{5}{16}$
July	$27\frac{7}{8}$	27	$27\frac{11}{16}$	$26\frac{3}{8}$	$31\frac{1}{2}$	$31\frac{1}{8}$	$30\frac{5}{8}$	$30\frac{3}{16}$	$28\frac{15}{16}$	$28\frac{7}{8}$
August	$27\frac{13}{16}$	$27\frac{1}{8}$	$26\frac{1}{2}$	$23\frac{3}{4}$	$31\frac{3}{8}$	$30\frac{3}{8}$	$30\frac{9}{16}$	$30\frac{1}{4}$	$30\frac{1}{2}$	$28\frac{11}{16}$
September	$28\frac{5}{16}$	$27\frac{11}{16}$	$27\frac{1}{4}$	$23\frac{3}{4}$	$30\frac{11}{16}$	30	$30\frac{9}{16}$	$30\frac{7}{16}$	$30\frac{1}{4}$	$29\frac{3}{16}$
October	$28\frac{1}{4}$	$27\frac{3}{16}$	$27\frac{1}{4}$	$25\frac{9}{16}$	$30\frac{5}{16}$	$29\frac{5}{8}$	$31\frac{3}{8}$	$30\frac{5}{8}$	$29\frac{9}{16}$	$28\frac{15}{16}$
November	$28\frac{5}{16}$	$27\frac{1}{2}$	$27\frac{1}{4}$	$26\frac{3}{8}$	$30\frac{3}{16}$	$29\frac{3}{4}$	31	$30\frac{5}{8}$	$29\frac{5}{16}$	$28\frac{5}{8}$
December	$27\frac{7}{8}$	$27\frac{1}{4}$	$27\frac{3}{4}$	$25\frac{15}{16}$	30	$29\frac{13}{16}$	$30\frac{11}{16}$	30	$28\frac{1}{2}$	$27\frac{3}{16}$
Yearly avge.	$26\frac{15}{16}$		$27\frac{9}{16}$		$30\frac{3}{4}$		$29\frac{7}{8}$		$28\frac{15}{16}$	
Highest price	$28\frac{5}{16}$		$29\frac{13}{16}$		$31\frac{9}{16}$		$31\frac{3}{8}$		$31\frac{1}{4}$	
Lowest ,,	25		$23\frac{3}{4}$		$29\frac{3}{4}$		$27\frac{3}{16}$		27	

" The cautious attitude evinced by the public towards Stock Exchange securities during the year 1897 was continued throughout the past year. It is difficult to assign a reason for this state of affairs, since, as we have shown, the year was a prosperous one, and profits generally were good. The political scares, although they had a considerable effect at the time they occurred, and may have reduced the average level of prices, could scarcely have affected the general volume of business to a large extent. There is no doubt, however, that in the latter part of the year a considerable section of the investing classes were greatly influenced by the disclosures of company promoting methods in the Hooley bankruptcy proceedings, and may have been induced to hold aloof altogether for a time from Stock Exchange dealings. Whatever the cause, the markets were for the most part in a condition of stagnation, and, as is usual in such circumstances, the average level of market values tended downwards. From the excellent comparison afforded by the *Bankers' Magazine*, whose calculations

we reprint below, it appears that the value of the 325 securities comprised in the table showed a net depreciation on the year of 34,713,000*l.*, the total value at December last being 3,241,219,000*l.*, as compared with 3,275,932,000*l.* at the end of 1897. The fall in prices was thus equal to 1·06 per cent. The statement is as follows :—

[000's omitted.]

Nominal Amount (Par Value).	Department, containing	Market Values end of December,		Increase or Decrease.	
		1898.	1897.	Amount.	Per Cent.
£		£	£	£	
800,194,	14 British and Indian funds	886,950,	901,986,	− 15,036,	1·7
36,379,	8 Corporation (U.K.) stocks	42,535,	44,046,	− 1,511,	3·4
49,417,	11 Colonial Government stocks....	52,626,	54,061,	− 1,435,	2·7
29,823,	5 Ditto inscribed ditto....	32,460,	33,011,	− 551,	1·7
928,539,	30 Foreign Government ditto....	805,254,	826,579,	− 21,325,	2·6
213,007,	19 British Railway Ordinary........	339,127,	342,962,	− 3,835,	1·1
171,118,	14 Ditto Debenture Ordinary	207,729,	217,891,	− 10,162,	4·7
128,803,	13 Ditto Preference Ordinary....	190,249,	199,864,	− 9,615,	4·3
47,010,	7 Indian Railways Ordinary	75,014,	74,564,	+ 450,	0·6
56,014,	{ 8 Railways in British possessions Ordinary .... }	28,410,	27,196,	+ 1,214,	4·4
89,000,	10 American railway shares	77,984,	68,132,	+ 9,852,	14·4
59,545,	12 Ditto bonds (gold)	47,213,	43,802,	+ 3,411,	7·7
7,605,	5 Ditto bonds (sterling)............	8,799,	7,659,	+ 1,140,	14·8
19,516,	12 Foreign railways	15,417,	15,956,	− 539,	3·4
84,216,	9 Ditto obligations	63,647,	64,300,	− 653,	1·01
	30 Bank shares—				
	{ 10 British bank shares	46,892,	44,926,	+ 1,966,	4·4
35,190,	{ 4 Australasian bank shares	7,636,	8,016,	− 380,	4·7
	{ 6 Other colonial bank shares...................... }	7,019,	6,688,	+ 331,	4·9
	{ 10 Semi-foreign bank shares	15,548,	15,129,	+ 419,	2·7
7,038,	{ 8 Corporation stocks (colonial and foreign) .... }	7,527,	7,436,	+ 91,	1·2
6,167,	8 Financial, land	7,710,	7,910,	− 200,	2·5
10,842,	4 Gas	29,436,	30,946,	− 1,510,	4·8
3,956,	14 Insurance	23,061,	24,399,	− 1,338,	5·4
6,055,	7 Coal, iron, and steel	10,632,	7,612,	+ 3,020,	39·6
20,716,	6 Canal and dock	66,599,	60,894,	+ 5,705,	9·3
4,529,	8 Breweries	13,163,	13,590,	− 427,	3·1
9,944,	15 Commercial, industrial, &c.	33,344,	29,889,	+ 3,455,	11·5
8,810,	10 Mines (chiefly South African)	43,799,	40,328,	+ 3,471,	8·6
4,966,	8 Shipping	6,682,	6,346,	+ 336,	5·2
17,914,	9 Telegraph and telephone	22,762,	22,563,	+ 199,	0·8
4,066,	11 Tram and omnibus	5,006,	5,155,	− 149,	2·8
8,553,	10 Waterworks	20,989,	22,096,	− 1,107,	4·1
2,868,932,	325　　Totals	3,241,219,	3,275,932,	− 34,713,	1·05

" One distinct feature of the year's business was the specially marked decline in the value of 'gilt-edged' securities, which could be only partially explained by the higher average rates for money

that prevailed during the period. British railways also underwent a decline in average value, and this must have been due mainly to the lack of interest on the part of the public, since the increase in receipts made it clear that dividends would, in all probability, be maintained at least at as high a level as was attained in the previous year.

"The greatest actual or proportionate improvement was that recorded in the values of American railroad securities. That was, of course, due to the outburst of commercial, industrial, and speculative activity which took place after the close of the war with Spain. Excitement in New York was responded to on this side to only a comparatively moderate extent, though the American market for a large part of the year afforded a striking contrast to the quietude prevailing in other departments. As was the case in 1897, however, sales in this market considerably preponderated over purchases, and it seems tolerably certain that the Americans have repurchased a very considerable portion of the railroad securities formerly held in Europe.

"Foreign railways were adversely affected by the breakdown in Brazil, whose railways are largely in the hands of English capitalists, and by the loss of credit in Chili, these being only partly counteracted by a further recovery in Argentina and some other countries. Beyond these circumstances and the fluctuations in Spanish stocks during and after the war with America, there was very little feature in the foreign market. The miscellaneous and mining sections were almost neglected throughout, and except that South Africans were supported in consequence of the constantly increasing output of gold, the general tendency of prices was towards a lower level.

"The amount of new capital applications in 1898, although it fell somewhat short of the total for 1897 or 1896, still reached the very substantial sum of 150,173,000*l.* The amounts offered quarter by quarter, and how these compare with the figures for the like periods of the four preceding years, are shown in the following table :—

[000's omitted.]

	1898.	1897.	1896.	1895.	1894.
	£	£	£	£	£
First quarter	48,054,	28,116,	30,925,	28,479,	11,358,
Second ,, ...	38,157,	47,777,	48,569,	23,710,	19,719,
Third ,, ...	37,705,	31,874,	41,287,	32,742,	18,140,
Fourth ,, ...	26,257,	49,522,	32,026,	19,759,	42,618,
	150,173,	157,289,	152,807,	104,690,	91,835,

"Classified as nearly as possible according to the objects to which the capital applied for during the year was intended to be devoted, the statement is as follows :—

	£
Foreign Government loans	24,103,400
Indian and colonial Government loans	11,016,000
British municipal and county loans	6,382,200
Colonial and foreign corporations	2,491,900
British railways	11,089,700
Indian and colonial railways	3,093,000
Foreign railways	12,003,000
Mining companies—	
Australasian	1,050,000
South African	1,744,500
Canadian, Klondike, &c	2,202,700
Other mines	2,084,800
Exploration, financial, and estate	5,082,300
Breweries and distilleries	18,386,500
Merchants and manufacturing businesses	16,074,900
Stores and trading	6,648,100
Electric lighting, power, &c	1,855,100
Gas and water	1,847,700
Hotels, theatres, and entertainments	2,859,700
Companies to acquire patents	5,154,500
Tramway and omnibus	2,455,500
Docks, harbours, and shipping	3,017,200
Cycle and motor companies	155,000
Banks and insurance	1,457,800
Miscellaneous	7,857,600
	150,173,000

" With the exception of the period of about four months from July to October, there was throughout the year a fairly steady flow of new issues. Government loans, though they sum up to the respectable total of 34 millions, were very few in number, the 24 millions raised by foreign governments being comprised in three issues : a Dutch loan, which was probably obtained principally in Holland ; the Chinese loan, one-half of which was subscribed in Germany, and the Greek guaranteed loan. For some reason, which is not very clear, issues of the 'gilt-edged' class of securities did not find a responsive market, and were consequently restricted in number and amount. Western Australia issued two loans of a million each for the development of the gold mining industry, New South Wales appeared for a million and a half, the Cape for a million and a quarter, and Natal for three quarters of a million, while India issued 6,000,000*l.* of $2\frac{1}{2}$ per cent. stock at a minimum of 89 per cent. In the first four months of the year some 3,000,000*l.* were offered by British municipalities, but the loans were not at all eagerly taken up at the prices fixed, and no more were forthcoming for several months. Then the Corporations of Birmingham and Bradford attempted issues of stock bearing only $2\frac{1}{2}$ per cent. interest, and these failed to attract tenders for the full amounts offered.

" Coming next to the promotions of joint stock companies, the

most prominent feature was the continuous flow of applications on account of breweries and distilleries, the aggregate amount raised during the year being no less than 18 millions. These companies have, it must be admitted, been very successful hitherto, owing to a period of great cheapness for brewing materials and other favourable circumstances. The large amount of capital attracted to the industry must, however, produce a very keen competition, and the basis of capitalisation will most likely in the end prove disastrous to a number of the weaker undertakings. In one section of the group an illustration of the effect of over-capitalisation is afforded by the present position of Scotch whisky distilleries, a large number of which have been converted into joint stock companies within a comparatively recent period. The leading features of industrial promotions were the combinations of firms in various classes of business, particularly the textile branches, while Lipton's, Pease and Partners, and Doulton's stand out prominently among the individual firms which have admitted the public to partnership. The year was somewhat remarkable for the absence of a 'boom' in any particular line of company promotion.

"The following is a statement of the capital applications and calls made in each of the ten years ending 1898 :—

	Capital Created and Issued.			Actual Money Calls.		
	In England.	England and elsewhere.	Total.	In England.	England and elsewhere.	Total.
	£	£	£	£	£	£
In 1898....	113,838,000	36,336,000	150,173,000	79,789,000	21,412,000	101,201,000
,, '97....	145,612,000	11,687,000	157,299,000	73,947,000	7,747,000	81,694,000
,, '96....	125,964,000	26,713,000	152,677,000	66,111,000	18,281,432	84,393,000
,, '95....	91,694,000	12,996,000	104,690,000	64,645,000	19,855,000	84,500,000
,, '94....	61,191,000	30,644,000	91,835,000	62,666,000	11,556,000	74,222,000
,, '93....	39,181,000	9,959,750	49,141,000	33,751,000	8,202,000	41,953,000
,, '92....	53,197,000	27,940,000	81,137,000	47,212,000	12,045,000	59,262,000
,, '91....	80,239,000	24,356,000	104,595,000	66,810,000	9,234,000	76,044,000
,, '90....	125,898,000	16,667,000	142,565,000	120,717,000	20,290,000	141,007,000
,, '89....	178,930,000	28,107,000	207,037,000	152,012,000	15,791,000	167,804,000

(A.)—*Volume and Value of our Foreign Trade of* 1898 *compared with that of* 1897.

"For a number of years past it has been our practice to analyse the annual Trade and Navigation Returns, so as to show to what extent the recorded movements in values have been due to variations in the volume of the year's trade, and how far to alterations in prices. The details of this analysis for the year 1898 will be found in the numbers of the *Economist* of the 21st and 28th January, and we now, as usual, bring together the main figures, in order that the broad results may be more clearly indicated :—

I. *Imports.*

	1898.		1897.
	Value in Trade and Navigation Returns.	Value Calculated at Prices of 1897.	Value in Trade and Navigation Returns.
	£	£	£
Living animals	10,386,000	10,627,000	11,380,000
Articles of food and drink	193,923,000	187,685,000	178,242,000
Tobacco	3,877,000	3,970,000	4,066,000
Metals	21,851,000	20,960,000	21,277,000
Chemicals, dye stuffs, and tanning materials	5,483,000	5,594,000	5,999,000
Oils	8,357,000	8,464,000	7,625,000
Raw materials for textile manufactures	71,268,000	76,490,000	70,066,000
Raw materials for sundry industries.	52,228,000	51,382,000	52,095,000
Manufactured articles	87,120,000	88,817,000	85,134,000
Miscellaneous ,,	14,798,000	14,009,000	14,140,000
Parcel post	1,313,000	1,237,000	1,005,000
Total imports	470,604,000	469,229,000	451,029,000
Deduct re-exports	60,619,000	60,217,000	59,954,000
Net imports	409,985,000	409,012,000	391,075,000

II. *Exports of British Products.*

	1898.		1897.
	Value in Trade and Navigation Returns.	Value Calculated at Prices of 1897.	Value in Trade and Navigation Returns.
	£	£	£
Living animals	1,105,000	1,153,000	1,132,000
Articles of food and drink	12,107,000	12,393,000	12,130,000
Raw materials	21,084,000	19,168,000	20,134,000
Yarn of all kinds	17,051,000	18,284,000	18,283,000
Textile fabrics of all kinds	77,461,000	79,236,000	78,295,000
Metals and machinery	51,171,000	49,910,000	50,728,000
Apparel and articles of personal use	9,573,000	9,866,000	9,874,000
Chemicals and chemical and medicinal preparations	8,373,000	8,438,000	8,699,000
All other articles	33,325,000	33,296,000	32,888,000
Parcel post	2,140,000	2,154,000	2,057,000
Total	233,390,000	233,898,000	234,220,000

" Dealing first with the volume of our trade, it is shown in Table I that in 1897 the total value of the imports retained for home consumption was 391,075,000*l.*, and that if we had paid for our net imports of last year the same average prices as in 1897, they would have cost us 409,012,000*l.* It follows therefore, that there was last year an increase in the quantity of our

net imports equal to the difference between 391,075,000*l.* and 409,012,000*l.*, which is 17,937,000*l.*, or 4·59 per cent. Then, as to our exports. In 1897 we exported British products to the value of 234,220,000*l.*, while our exports in 1898, if we had obtained for them the same prices as in 1897, would have realised 233,898,000*l.*; and the difference between these two amounts, which works out at a decrease of 322,000*l.*, or 0·14 per cent., is the measure of the diminution in the quantity of our shipments in 1897. Taking imports and exports together, the volume of our foreign trade last year (exclusive of re-exports) shows as compared with 1897, an increase of 0·51 per cent., the figures being :—

	£
Actual value of net imports and of exports of British products in 1897..............................	625,295,000
Value of net imports and of exports of British products in 1898, calculated at the prices of 1897	642,910,000
Increase in 1898, due to larger quantities....	17,615,000 = 2·82 per cent.

"Next, as to prices. The actual cost of our imports for home consumption last year was 409,985,000*l.*, whereas if we had paid for them the same average prices as in 1896, they would have cost us 409,012,000*l.* Thus, owing to higher prices, there was an increase in the cost of our imports of 973,000*l.*, or 0·24 per cent.; or, in other words, the prices of the imports were on the average 0·24 per cent. higher in 1898 than in 1897. But an opposite movement is shown in the export. Our total exports of British products in 1898 are valued at 233,390,000*l.* If, however, their value had been calculated at the same average prices as in 1897, it would have amounted to 233,898,000*l.*, and there was thus a decrease in value due to lower prices of only 598,000*l.* or 0·26 per cent. In imports and exports combined the increase in value, owing to higher prices, amounted to 465,000*l.*, or 0·07 per cent., the calculation working out thus :—

	£
Value of net imports and of exports of British products for 1898, calculated at prices of 1897	642,910,000
Actual value in Trade and Navigation Returns..	643,375,000
Increase due to higher prices in 1898	465,000 = 0·07 per cent.

(B.)—*Railway Traffic Receipts in* 1898 *and* 1897.

"Subjoined is an analysis of the traffic receipts of fifteen of the principal English railways during the past two years :—

First Half-Year.
[00's omitted.]

	Passengers, Parcels, and Mails.		Merchandise.		Minerals.		Live Stock.	
	1898.	1897.	1898.	1897.	1898.	1897.	1898.	1897
	£	£	£	£	£	£	£	£
London and N. Western	2,513,7	2,439,3	2,161,4	2,101,3	1,325,2	1,235,4	88,6	92,3
Great Western	2,141,6	2,081,6	1,224,0	1,205,2	1,117,9	1,256,1	65,0	62,6
Midland	1,510,8	1,462,3	1,959,3	1,889,9	1,370,6	1,273,6	42,5	44,5
North Eastern	1,113,2	1,080,6	1,273,4	1,249,4	1,339,5	1,284,7	51,2	52,6
Lancashire & Yorkshire	1,001,1	977,4	878,2	850,0	534,1	499,0	18,5	19,2
Great Northern	884,9	854,7	798,9	757,6	429,6	393,9	23,7	26,1
,, Eastern	1,165,3	1,130,9	672,9	651,9	252,8	236,1	43,8	41,8
London and S. Western	1,287,9	1,280,5	410,8	403,9	171,1	160,9	17,2	17,7
South Eastern	816,0	785,3	205,4	196,6	98,7	92,2	6,0	5,8
London, Brighton	960,9	941,7	202,7	196,6	139,4	132,7	5,2	5,2
Great Central	290,1	288,4	488,9	468,2	380,3	355,4	9,1	9,9
London, Chatham, and Dover	519,3	517,6	89,0	84,3	64,7	58,4	2,3	2,8
North Staffordshire	120,5	119,1	127,9	123,9	128,9	115,6	2,0	2,0
Metropolitan	349,5	348,2	32,3	25,4	14,6	14,4	0	
North London	162,5	167,0	64,0	62,6	19,9	17,5	3	8
Total	14,837,3	14,474,6	10,589,1	10,266,8	7,382,3	7,125,9	376,3	383,
	+ £362,7		+ £322,3		+ £256,4		− £7,4	

Second Half-Year.
[00's omitted.]

	1898.	1897.	1898.	1897.	1898.	1897.	1898.	1897
London and N. Western	3,044,6	2,945,1	2,262,3	2,173,5	1,383,4	1,331,4	126,6	127,0
Great Western	2,620,2	2,547,2	1,306,7	1,327,0	1,165,5	1,277,4	72,2	70,6
Midland	1,776,5	1,720,3	2,088,1	1,989,6	1,478,3	1,416,3	46,0	44,5
North Eastern	1,479,9	1,372,4	1,364,5	1,300,6	1,414,9	1,354,3	53,0	50,2
Lancashire & Yorkshire	1,169,0	1,105,0	896,4	884,6	544,7	521,1	21,7	21,2
Great Northern	1,078,5	1,036,0	882,8	826,4	456,6	445,2	22,6	20,8
,, Eastern	1,540,8	1,475,3	747,2	713,9	278,9	270,7	34,2	32,1
London and S. Western	1,542,5	1,471,2	448,2	435,0	177,8	168,4	21,6	21,7
South Eastern	988,4	947,1	240,1	220,7	104,8	108,2	7,5	8,4
London, Brighton	1,163,2	1,108,9	229,6	218,1	156,7	149,7	5,6	5,8
Great Central	353,3	335,3	482,1	469,2	411,1	375,3	9,5	7,9
London, Chatham, and Dover	635,6	626,3	111,2	101,8	69,6	64,7	3,8	4,0
North Staffordshire	139,7	131,2	129,7	128,2	125,0	121,6	2,2	2,0
Metropolitan	341,7	346,7	32,9	27,5	19,6	15,8	4	
North London	165,3	166,6	67,8	64,7	26,1	21,2	9	1,1
Total	18,039,2	17,334,6	11,289,6	10,880,8	7,813,0	7,641,3	427,8	417,1
	+ £704,6		+ £408,8		+ £171,7		+ £10,7	

VI.—*Prices of Commodities in* 1898.   By A. Sauerbeck.

The following table shows the course of prices of forty-five commodities during the last twenty years as compared with the standard period of eleven years, 1867-77, which in the aggregate is equivalent to the average of the twenty-five years 1853-77 (see the Society's *Journal*, 1886, pp. 592 and 648, and 1893, pp. 220 and 247):—

Summary of Index Numbers.   Groups of Articles, 1867-77 = 100.

	Vegetable Food (Corn, &c.).	Animal Food (Meat, &c.).	Sugar, Coffee, and Tea.	Total Food.	Minerals.	Textiles.	Sundry Materials.	Total Materials.	Grand Total.	Silver.*	Wheat Harvest.†	Average Price of Consols.‡	Average Bank of England Rate.‡
1879	87	94	87	90	73	74	85	78	83	84·2	64	97½	$2\frac{3}{8}$
'80	89	101	88	94	79	81	89	84	88	85·9	93	98¾	$2\frac{3}{4}$
'81	84	101	84	91	77	77	86	80	85	85·0	97	100	$3\frac{1}{2}$
'82	84	104	76	89	79	73	85	80	84	84·9	100	100½	$4\frac{1}{8}$
'83	82	103	77	89	76	70	84	77	82	83·1	93	$101\frac{3}{16}$	$3\frac{9}{16}$
1884	71	97	63	79	68	68	81	73	76	83·3	103	101	3
'85	68	88	63	74	66	65	76	70	72	79·9	108	99¼	3
'86	65	87	60	72	67	63	69	67	69	74·6	93	100¾	3
'87	64	79	67	70	69	65	67	67	68	73·3	110	101¾	$3\frac{3}{16}$
'88	67	82	65	72	78	64	67	69	70	70·4	96	101	$3\frac{3}{16}$
1889	65	86	75	75	75	70	68	70	72	70·2	103	98	$3\frac{6}{16}$
'90	65	82	70	73	80	66	69	71	72	78·4	106	96½	$4\frac{5}{16}$
'91	75	81	71	77	76	59	69	68	72	74·1	108	95¾	$3\frac{5}{16}$
'92	65	84	69	73	71	57	67	65	68	65·4	91	96¾	$2\frac{9}{16}$
'93	59	85	75	72	68	59	68	65	68	58·6	90	98½	$3\frac{1}{16}$
1894	55	80	65	66	64	53	64	60	63	47·6	106	101	$2\frac{1}{16}$
'95	54	78	62	64	62	52	65	60	62	49·1	91	106¼	2
'96	53	73	59	62	63	54	63	60	61	50·5	116	111	$2\frac{5}{16}$
'97	60	79	52	65	66	51	62	59	62	45·3	100	112¼	$2\frac{6}{16}$
'98	67	77	51	68	70	51	63	61	64	44·3	120	111	$3\frac{1}{4}$
Average 1888-97	62	81	66	70	70	59	66	65	67	61·0	101	101¾	$2\frac{9}{10}$
'78-87	79	95	76	84	73	71	81	76	79	82·1	97	99½	$3\frac{2}{10}$

* Silver 60·84 per oz. = 100.

† Wheat harvest in the United Kingdom, 1879-83, 28 bushels per acre = 100, from 1884, 29 bushels = 100.

‡ Consols and bank rate actual figures, not index numbers; consols 2¾ per cent. from 1889.

The index number for all commodities was 64, against 62 in 1897, or 36 per cent. below the standard period 1867-77, and 19 per cent. below the ten years 1878-87. It is still three points or 4½ per cent. below the average of the ten years 1888-97, but it must be welcomed as the best since the eventful year 1893, the time of the Australian and American crises, and the closing of the Indian mint. The rise is equally shared by the two large classes, food and materials; but in the first case it is entirely due

to corn, and in the second to minerals. Animal food products were in the aggregate lower, sugar was a little better, but Brazil coffee again considerably reduced. Textiles remained on the average on a par with the preceding year, which was the lowest on record, and they would have been still lower but for the extraordinary rise in Manila hemp. The averages of cotton, flax, and English wool have never been lower. Sundry materials were a little higher, particularly hides, tallow and oils, while indigo was cheaper.

Only three articles out of the 45 contained in my tables showed records of lowest prices, viz., English wool, flax, and indigo.

The monthly fluctuations were as follows :—

December, 1889....	73·7	December, 1896....	62·0	July, 1898....	64·3
,, '90....	71·1	September, '97....	63·4	August, ,, ...	64·0
,, '91....	71·4	December, ,, ...	62·4	September, ,, ...	63·9
,, '92....	67·7	January, '98....	62·8	October, ,, ...	63·6
,, '93....	67·0	February, ,, ...	63·4	November, ,, ...	63·9
,, '94....	60·1	March, ,, ...	63·0	December, ,, ...	63·8
February, 1895....	60·0	April, ,, ...	65·5	January, 1899....	65·4
December, ,, ...	61·2	May, ,, ...	66·4	February, ,, ...	65·8
July, 1896....	59·2	June, ,, ...	64·7		

The index number at the end of the year was 2 per cent. higher than in December, 1897. It has further risen in January and February of the present year, principally in consequence of the movements of metals.

Taking articles of food and materials separately, the index numbers compare thus :—

	February, 1895.	July, 1896.	May, 1897.	December, 1897.	May, 1898.	December, 1898.
Food	63·8	60·0	63·7	66·5	71·5	65·6
Materials....	57·0	58·6	59·4	59·4	62·7	62·4

At the end of 1898 articles of food were $1\frac{1}{2}$ per cent. lower, materials 5 per cent. higher than in December, 1897, but both classes were nearly 10 per cent. above their lowest points on record in July, 1896, and February, 1895, respectively.

The *supply* of some articles and the *demand* for others were most powerful elements in regulating the course of prices during the past year. The supply of corn caused violent fluctuations. Owing to the failure of the continental harvest in 1897, the production of wheat in that season was the smallest for a number of years past,[37] and prices advanced considerably in the second half of

[37] The wheat crops of the world are estimated in *million bushels* :—

1891	2,382	1895	2,497
'92	2,411	'96	2,400
'93	2,458	'97	2,258
'94	2,562	'98	2,800

the year.   The scarcity became more manifest in April and May, 1898, and partly owing to American speculation, to the outbreak of the war, and to the suspension for a limited time of the high French duties, prices were carried to an exceedingly high level, considering the general range of values.   A collapse followed in June, and in view of the splendid 1898 harvest, the largest on record, prices gradually returned to a more moderate basis.   The course of prices is best illustrated by the following quotations :—

	Wheat, English, Gazette.	Wheat, American.	Flour, Town Made, White.
	s. per qtr.	*s.* per qtr.	*s.* per 280 lbs.
Average, 1867–77	54½	56	46
,, '78–87	40	43½	34½
,, '88–97	29	32	27½
Lowest, October, 1894	17½	21	20½
End December, 1897...............	34	39	33
,, May, 1898	48	50	43
,, December, 1898	27	31½	28½

Other articles that were largely affected by the supplies were coffee, with unprecedented Brazil crops and large accumulations of stocks ; cotton with two gigantic crops, and wool, owing to the steady increase during the last few years in the production of the coarser grades, simultaneously with a large decrease in fine wool. Coffee and cotton remained in consequence on a very low level, coarse wool was cheaper than ever, while fine wool ruled about 30 per cent. above the lowest point in 1895.   Manila hemp doubled its price during the war, and is still considerably higher than a year ago.

The articles affected principally by demand were metals.   The production of iron in Great Britain and Germany, and particularly in the United States, where the output reached $11\frac{3}{4}$ million tons, was larger than ever, but so was the demand, and prices at the end of the year were : for Scotch pig 49*s.* 6*d.* against 45*s.* 5*d.*, for hematite 57*s.* 2*d.* against 48*s.* 4*d.*, and for common bars $6\frac{1}{8}l.$ against $5\frac{1}{4}l.$ at the end of 1897.   The production of copper has also experienced a steady increase, while the stocks have constantly diminished.   The average annual prices from 1894-98 were 40*l.*, 43*l.*, 47*l.*, 49*l.*, and 52*l.*; the price at the beginning of last year was $48\frac{1}{4}l.$ and at the close $57\frac{1}{2}l.$ Tin arrived in smaller quantities, and the price rose in the year from 63*l.* to 86*l.*   Both copper and tin have experienced a further considerable rise in January and February, and have touched $75\frac{1}{2}l.$ and $114\frac{1}{2}l.$ respectively.

The average price of *silver* was $26\frac{15}{16}d.$ per oz., the lowest on record, against $27\frac{9}{16}d.$ in 1897.   It stood at $26\frac{5}{8}d.$ (index number 43·8) at the end of 1897, and declined to 25*d.* early in March.   In May Spain commenced buying, and altogether about 4 million £ were taken for that quarter.   The price ruled between 27*d.* and $28\frac{1}{4}d.$ during the remainder of the year, and closed at $27\frac{5}{16}d.$ per oz. (index number 44·9).   The shipments to India were smaller

than in the preceding year, but Russia took a moderate amount, and will still have to purchase silver to some extent for several years to come.

*Quarterly Movements of Prices.**

Summary of Index Numbers, 1867-77 = 100.

Years.	Quar-ters.	Vege-table Food (Corn, &c.).	Animal Food (Meat, &c.).	Sugar, Coffee, and Tea.	Total Food.	Mine-rals.	Tex-tiles.	Sundry Mate-rials.	Total Mate-rials.	Grand Total.	Silver.†
1889....	IV	66·3	86·0	67·2	73·1	83·9	70·7	68·1	73·2	**73·2**	71·4
'90....	IV	67·4	82·0	71·2	73·6	80·5	62·7	69·5	70·4	**71·7**	79·6
'91....	IV	77·2	80·8	68·7	76·7	73·9	58·6	69·0	67·1	**71·2**	72·1
'92....	IV	60·7	83·6	72·7	71·7	69·5	57·3	67·4	64·9	**67·7**	64·0
'93....	IV	58·6	83·2	70·5	70·2	72·3	58·7	67·2	66·0	**67·8**	52·2
'94....	IV	53·2	78·4	60·8	64·1	62·3	48·2	63·5	58·5	**60·9**	46·6
'95 {	I	54·2	77·3	61·3	64·2	60·8	46·5	63·1	57·3	**60·3**	46·4
	II	57·9	77·5	60·9	65·8	61·3	49·8	65·5	59·6	**62·2**	50·0
	III	53·7	80·3	61·2	65·1	63·5	54·6	66·1	61·9	**63·2**	50·0
	IV	51·6	74·0	62·2	62·1	63·8	56·8	65·5	62·4	**62·3**	50·5
'96 {	I	50·4	71·7	62·8	60·8	63·2	55·5	64·5	61·4	**61·1**	51·1
	II	49·2	71·4	61·2	59·9	62·4	53·7	62·8	59·9	**59·9**	51·4
	III	50·5	75·2	56·6	60·9	62·2	53·2	62·1	59·4	**60·1**	50·6
	IV	60·3	74·3	55·2	64·4	65·9	54·1	62·8	60·9	**62·4**	49·1
'97 {	I	57·5	77·3	55·2	64·3	65·8	52·0	62·5	60·2	**61·9**	48·0
	II	56·1	80·0	52·0	64·0	64·0	51·5	62·3	59·4	**61·3**	45·7
	III	62·1	80·1	51·0	66·4	65·4	51·1	63·2	60·1	**62·8**	41·5
	IV	65·0	78·4	50·3	66·8	66·7	48·8	62·3	59·3	**62·5**	44·7
'98 {	I	67·0	78·0	50·5	67·6	67·0	49·4	62·9	59·9	**63·1**	42·4
	II	76·2	75·0	50·4	70·3	69·2	52·4	64·5	62·1	**65·5**	44·1
	III	65·0	78·1	51·3	67·0	71·0	51·5	63·9	62·0	**64·1**	45·4
	IV	62·4	76·8	52·3	65·6	75·0	50·4	63·3	62·5	**63·8**	45·5

* The four quarterly figures of each year do not in all cases exactly (in the decimals) agree with the annual averages, as the latter are partly calculated from revised figures. See also the Society's *Journal*, 1893, p. 221, and 1895, p. 144.

† Silver 60·84*d.* per oz. = 100.

The quarterly numbers show the average of three monthly figures, and by thus eliminating minor fluctuations they give a more reliable comparison of the gradual changes of the various groups of commodities. They illustrate the great movements of corn, the steady improvement of minerals, and the influence of the value of Manila hemp on textiles in the second and third quarter. Animal food remained on a lower level than in 1897, but still somewhat higher than in 1896.

The following figures show in each case the average index numbers of all the forty-five commodities for ten years (see the dotted line in the diagram of the *Journal*, 1886); they give the

best picture of the gradual movement of the *average* prices of *whole periods*, as the ordinary fluctuations are still further obliterated :—

1818–27 = 111	1878–87 = 79	1884–93 = 71
'28–37 = 93	'79–88 = 78	'85–94 = 69
'38–47 = 93	'80–89 = 76	'86–95 = 68
'48–57 = 89	'81–90 = 75	'87–96 = 68
'58–67 = 99	'82–91 = 74	'88–97 = 67
'68–77 = 100	'83–92 = 72	'89–98 = 66

The *past year* was rich in political events, but it does not appear that they had a lasting influence on trade generally, though, as already mentioned, the American war affected corn and hemp.   Business, on the whole, was more prosperous, the working classes were better employed, agriculture was more profitable, and the metal industries, engineering, shipbuilding and electrical works were fully occupied ; but there were other branches, particularly the textile industries, which were far from satisfactory.   The cotton industry—in this country at all events— was better than in the bad year 1897 ; but the woollen industry all over Europe and North America was depressed.   Company promotion and new issues of capital continued on a large scale. They amounted to 150 million £ in this country, and reached in Germany the record figure of 135 million £.   No doubt things went too fast in the latter country, and hence the squeeze in the money market during the last quarter of the year.   The surprise of the world was the marvellous development in the United States.   The excess in the exports over imports (merchandise and silver) had already reached the extraordinary amounts of 358 million dollars in 1896 and 383 million dollars in 1897, but for the past year it was swelled to the huge figure of 645 million dollars.   Against this trade balance the States have taken gold and bonds, paid off debts and created credit balances in Europe, but the long expected return of demand for European produce is still in abeyance.   Other extra-European countries, particularly the East, Australia, and South America, make also slow progress, and the *future of prices* of raw materials will to some extent depend on the development of affairs there and on the American demand.   For textiles in particular more moderate cotton crops will also be necessary, as the supply is evidently too large.

The production of *gold* was as follows, according to the Director of the Mint at Washington :—

	Kilos. Fine.	Value. £
1894	....	272,600 = 37,200,000
'95	....	299,100 = 40,800,000
'96	....	305,000 = 41,700,000
'97	....	357,400 = 48,800,000

In 1898 the production probably reached 60 million £, but of these no less than 41 million £ were retained by the United States, viz., about 17 million £ by the Treasury, 15 million £ by the

National Banks, and 9 million £ for internal circulation. Russia added to her total stock another 12 million £,[38] while the three most important European banks (of England, France, and Germany) held 10 million £ less at the end of last year than at the end of 1897. It is probable, however, that the internal circulation of England and Germany has increased.

The *rate of discount* has of late shown a rising tendency, owing to the various influences enumerated: new issues, improved business, and American demand for gold. The average rates of the three principal markets were thus:—

[Per cent. and two decimals.]

	London.		Paris.		Berlin.		Average of the Three Markets.	
	Bank Rate.	Market Rate.	Bank Rate.	Market Rate.	Bank Rate.	Market Rate.	Bank Rate.	Market Rate.
	Per cnt.	Per cnt.	Per cnt.	Per cnt.	Per cnt.	Per cnt	Per cnt.	Per cnt.
1894	2·10	0·94	2·50	1·77	3·12	1·77	2·57	1·49
'95	2·00	0·80	2·10	1·59	3·14	2·02	2·41	1·47
'96	2·50	1·40	2·00	1·75	3·66	2·99	2·72	2·05
'97	2·60	1·80	2·00	1·81	3·81	3·09	2·80	2·23
'98	3·25	2·60	2·20	2·07	4·26	3·57	3·24	2·75

The year 1895 was the lowest on record, and the average rise in the market rate since then amounts to over $1\frac{1}{4}$ per cent.

The arithmetical mean of the 45 index numbers, which is 64 (against 62 in 1897), has, as in former years, again been subjected to two tests:—

Firstly, by using the same index numbers of the separate articles, but calculating each article according to its importance in the United Kingdom on the average of the three years 1894-96, when the mean for 1898 is 64·7, against 62·5 in 1897; or on the average of the five years 1871-75, when the mean for 1898 is also 64·7, against 62·6 in 1897. Measured according to quantities the index number would therefore be a little higher than the arithmetical mean, and the reason for this is the rise in the case of some very important articles, such as corn, potatoes, and coal.

Secondly, by calculating the quantities in the United Kingdom at their actual values (the production on the basis of my price tables, the imports at Board of Trade values, and consequently a considerable portion according to a different set of prices) and at the nominal values on the basis of the average prices from 1867-77. In this case the mean is 64·6, against 63·5 in 1897.

The following table gives the figures which have served for the second test (see also the Society's *Journal*, 1886, pp. 613—19):—

[38] Stock and circulation in Russia officially estimated at 1,591 million roubles at the end of 1898, against 1,470 million roubles at the end of 1897.

Movements of Forty-five Commodities in the United Kingdom (Production and Imports).

	Estimated Actual Value in each Period.	Nominal Values at Average Prices of 1867-77, showing Increase in Quantities.	Movement of Quantities,		Movement of Quantities from Period to Period.	Ratio of Prices according to this Table, 1867-77 = 100.
			1848-50 = 100.	1871-75 = 100.		
	Mln. £'s and dec.	Mln. £'s and dec.				
Avge. 1848-50....	219·8	294·8	100	56	—	74·6
„ '59-61....	350·1	382·7	130	73	30% over 1849	91·5
„ '69-71....	456·6	484·6	164	92	27% „ '60	94·2
„ '71-75....	548·8	526·3	178	100	—	104·3
„ '74-76....	537·8	538·4	183	102	—	99·9
„ '79-81....	489·7	578·5	196	110	19% over 1870	84·6
„ '84-86....	445·7	610·1	207	116	—	73·0
„ '89-91....	504·1	685·2	233	130	18% over 1880	73·6
„ '94-96....	453·7	723·5	245	137	—	62·7
1896....................	461·2	743·0	252	141	—	62·0
'97........	465·1	732·2	248	139	}10% over 1890	63·5
'98*	498·7	772·3	262	147		64·6

* 1898 subject to correction after publication of the complete mineral produce returns.

The nominal values at the uniform prices of 1867-77 show the exact movements of quantities in the aggregate. The average quantities for the last two years were 10 per cent. larger than in 1889-91, 43 per cent. larger than in 1871-75, and 155 per cent. larger than in 1849.

The total imports into the United Kingdom and the exports of British and Irish produce last year were 704 million £ against 685,600,000l. in 1897, or calculated at the prices of the preceding year 703,100,000l. against 689,500,000l. in 1897, and at 1873 prices 1,201 million £ against 1,176 million £ in 1897, giving an index number of 64·8 against 64·7 in 1897, 65·1 in 1896, and 64·1 in 1895 (see the *Journal*, 1897, p. 187). The figures show little variation, and the explanation is that the Board of Trade values follow the movements more slowly than actual market prices; in 1896 they were probably too high, in 1898 possibly a little too low. Besides they do not include the home production, the value

of which was seriously affected by low prices for meat and coals
in 1896, and by higher prices for corn and coals in 1898.

The 704 million £ of imports and exports, which are exclusive
of re-exports of foreign goods already comprised in the imports,
may be divided into five classes, in relation to the 45 descriptions
of commodities treated in my tables, viz. :—[39]

	Value.	Percentage of Total.	
	mln. £.		
I. The same articles	318	45·2	69·3
II. Articles manufactured from the same	170	24·1	
III. Manufactures in an advanced stage on which the prices of the raw materials have but a moderate influence	39	5·6	19·9
IV. Competing articles, being to some extent influenced	101	14·3	
V. Entirely different articles, or having but very little connection	76	10·8	10·8
	704	100·0	100·0

The 45 commodities represent therefore 69 per cent. of the
external trade, while 20 per cent. are more or less influenced by
them, and less than 11 per cent. only are practically independent.
In addition the home production of the 45 commodities, so far as
traced, represents a value of 231 million £. The home production
or consumption of the other articles cannot be stated.

Construction of the Tables.

The Table of *Index Numbers* is based on the average prices
of the eleven years 1867-77, and the index numbers have been

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[39] The five classes comprise the following articles :—

1. All commodities in my tables including live animals for food, all kinds
of meat, iron ore, and pyrites.

2. Manufactures of textiles, leather and metals, soap, candles and oil,
biscuit, cheese, &c.

3. All kinds of machinery, carriages, saddlery, apparel and articles of
personal use.

4. All other sorts of food and drink, such as peas, beans, vegetables, spices,
fruit, hops, eggs, fish, poultry, cocoa, wine, spirits and beer, also tobacco,
competing metals, dyes, oils, seeds, skins, manure, &c.

5. Horses, salt, quicksilver, silver ore, cutch, drugs, chemicals, caoutchouc,
cement, ivory, paper, glass, clocks, instruments, and arms.

Some sundry materials and manufactures not specified were divided
between classes 4 and 5.

calculated in the ordinary arithmetical way; for instance, English wheat:—

		s.	*d.*	
Average, 1867-77....	54	6	= 100, average point.
,,	'55	74	8	= 137, or 37 per cent. above the average point.
,,	'98	34	–	= 62, ,, 38 ,, below ,,

The index numbers therefore represent simple percentages of the average point.

Certain articles which appear to have something in common have been grouped together, with the following result:—

		Example for 1898.	
		Total Numbers.	Average.
1. Vegetable food, corn, &c. (wheat, flour, barley, oats, maize, potatoes, and rice)	With 8 Index Nos.	538	67
2. Animal food (beef, mutton, pork, bacon, and butter)............................	,, 7 ,,	542	77
3. Sugar, coffee, and tea	,, 4 ,,	205	51
1—3. *Food*	,, 19 ,,	1,285	68
4. Minerals (iron, copper, tin, lead, and coals)	,, 7 ,,	493	70
5. Textiles (cotton, flax, hemp, jute, wool, and silk)	,, 8 ,,	405	51
6. Sundry materials (hides, leather, tallow, oils, soda, nitrate, indigo, and timber)	,, 11 ,,	698	63
4—6. *Materials*............................	,, 26 ,,	1,596	61
General average	,, 45 ,,	2,881	64

The *general average* is drawn from all 45 descriptions, which are treated as of equal value, and is the simple arithmetical mean as shown above.

*Average Prices of Commodities.**

No. of Article ∫	0	1	2	3	4	5	6	7	8	1—8	9
		Wheat.		Flour.	Barley.	Oats.	Maize.	Potatoes.*	Rice.		Beef.‡
Year.	Silver.†	English Gazette.	American.	Town Made White.	English Gazette.	English Gazette.	American Mixed.	Good English.	Rangoon Cargoes to Arrive.	Vegetable Food. Total.	Prime.
	d. per oz.	s. and d. per qr.	s. and d. per qr.	s. per sack (280 lbs.).	s. and d. per qr.	s. and d. per qr.	s. per qr.	s. per ton	s. and d. per cwt.		d. per 8 lbs.
1884........	50 1/16	35·8	36·6	31	30·8	20·3	25 1/4	75	7·8	—	58
'85........	48 5/8	32·10	35	29	30·1	20·7	23	75	7	—	52
'86........	45 3/8	31	35	28	26·7	19	21	80	6·7	—	49
'87........	44 5/8	32·6	34	28	25·4	16·3	21 1/4	85	6·10	—	43
'88........	42 7/8	31·10	37	30	27·10	16·9	23 1/2	80	7·1	—	48
1889........	42 11/16	29·9	35	29	25·10	17·9	20	80	7·3	—	47
'90........	47 7/16	31·11	35·6	29	28·8	18·7	20	70	7·3	—	47
'91........	45 1/16	37	40	33	28·2	20	28	92	7·11	—	47
'92........	39 13/16	30·3	33	28	26·2	19·10	21 3/4	70	7·8	—	47
'93........	35 5/8	26·4	27·6	26	25·7	18·9	20	65	6·2	—	48
1894........	28 15/16	22·10	23·6	22	24·6	17·1	20	70	5·10	—	47
'95........	29 5/8	23·1	25·6	23	21·11	14·6	19 1/2	80	5·6	—	47
'96........	30 3/4	26·2	29	25	22·11	14·9	15	55	6·2	—	45
'97........	27 9/16	30·2	34·6	30	23·6	16·11	14 3/4	70	6·9	—	47
'98........	26 15/16	34	37	33	27·2	18·5	17 3/4	82	7·2	—	46
Average 1888–97	37	29	32	27 1/2	25 1/3	17 1/2	20 1/4	73	6 3/4	—	47
'78–87	50	40	43 1/2	34 1/2	31 1/2	21	25	102	8	—	55 1/2
'67–77	58 1/2	54 1/2	56	46	39	26	32 1/2	117	10	—	59

Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

1884........	83·3	65	65	65	79	78	78	64	77	571	98
'85........	79·9	60	62	63	77	79	71	64	70	546	88
'86........	74·6	57	62	61	68	73	65	69	66	521	83
'87........	73·3	60	61	61	65	63	65	73	68	516	73
'88........	70·4	58	66	65	71	64	72	69	71	536	81
1889........	70·2	55	63	63	66	69	61	69	72	518	80
'90........	78·4	59	63	63	73	72	61	60	72	523	80
'91........	74·1	68	71	72	72	77	86	79	79	604	80
'92........	65·4	56	59	61	67	76	67	60	77	523	80
'93........	58·6	48	50	54	66	72	61	56	62	469	81
1894........	47·6	41	42	48	63	66	61	60	58	439	80
'95........	49·1	42	46	50	56	56	60	68	55	433	80
'96........	50·5	48	52	54	59	57	46	47	62	425	76
'97........	45·3	55	62	65	60	65	45	61	67	480	80
'98........	44·3	62	66	72	70	71	55	70	72	538	78

* The annual prices are the averages of twelve monthly or fifty-two weekly quotations; potatoes of eight monthly quotations, January to April and September to December.

† Index numbers of silver as compared with 60·84d. per ounce being the parity between gold and silver at 1 : 15½; not included in the general average.

‡ Meat (9—13), by the carcase, in the London meat market.

Average Prices of Commodities—Contd.

No. of Article	10	11	12	13	14	15	9—15	16A	16B	17	18A*	18B*
	Beef.	Mutton.		Pork.	Bacon.	Butter.		Sugar.			Coffee.	
Year.	Middling.	Prime.	Middling.	Large and Small, Average.	Waterford.	Friesland, Fine to Finest.	Animal Food Total.	British West Indian Refining.	Beet, German, 88 p. c., f.o.b.	Java, Floating Cargoes.	Ceylon Plantation, Low Middling.	Rio, Good Channel.
	d. per 8 lbs.	d. per 8 lbs.	d. per 8 lbs.	d. per 8 lbs.	s. per cwt.	s. per cwt.		s. per cwt.	s. per cwt.	s. per cwt.	s. per cwt.	s. per cwt.
1884........	49	64	53	48	70	120	—	13¼	13¾	17½	162	47
'85........	44	56	47	45	68	111	—	13½	14¼	17½	60	39
'86........	40	62	50	45	67	100	—	11¾	11¾	14½	68	46
'87........	36	52	42	43	61	103	—	11¾	12½	14½	90	78
'88........	39	58	47	40	61	100	—	13	13¾	16	80	64
1889........	39	63	50	43	66	102	—	16	16½	19	95	76
'90........	38	59	45	42	62	100	—	13	12½	15¼	101	83
'91........	40	53	42	39	63	106	—	13½	13½	15½	101	76
'92........	38	53	42	48	68	108	—	13¼	13¾	16	104	68
'93........	39	53	42	50	68	106	—	14¼	15	17¼	103	81
1894........	37	55	42	44	59	98	—	11¼	11¼	13¾	102	75
'95........	37	58	44	37	54	93	—	10	10	12	98	74
'96........	34	53	39	35	50	98	—	10¾	10½	12½	95	58
'97........	36	55	41	44	59	94	—	9¼	8⅞	11	95	40
'98........	36	52	37	45	58	95	—	9½	9½	11¾	92	32
Average 1888-97	37½	56	43½	42	61	100	—	12½	12½	14¾	97	70
'78-87	46	64½	53	49	71	116	—	17	18	21½	78	52
'67-77	50	63	55	52	74	125	—	23	24	28½	87	64

Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

Year	10	11	12	13	14	15	9—15	16A–16B (Sugar)	17	18A*	18B*
1884........	98	102	96	92	95	96	677	56	62	91	74
'85........	88	89	85	87	92	89	618	59	62	69	61
'86........	80	98	91	87	91	80	610	50	50	78	72
'87........	72	83	76	83	82	82	551	52	51	104	122
'88........	78	92	85	77	82	80	575	57	56	92	100
1889........	78	100	91	83	89	82	603	69	67	109	119
'90........	76	94	82	81	84	80	577	54	54	116	130
'91........	80	84	76	75	85	85	565	57	54	116	119
'92........	76	84	76	92	92	86	586	58	56	120	106
'93........	78	84	76	96	92	85	592	62	61	118	127
1894........	74	87	76	85	80	78	560	48	48	117	117
'95........	74	92	80	71	73	74	544	43	42	113	116
'96........	68	84	71	67	68	78	512	46	44	109	91
'97........	72	87	75	85	80	75	554	39	39	109	64
'98........	72	84	67	87	78	76	542	40	41	106	50

* Index numbers not included in the general average.

Average Prices of Commodities—Contd.

No. of Article	18	19A*	19B*	19	16—19	1—19	20	21	22	—	23
	Coffee.	Tea.			Sugar, Coffee, and Tea.	Food.	Iron.		Copper.		Tin.
Year.	Mean of 18A and 18B.	Congou, Common. d. per lb.	Average Import Price. d. and dec. per lb.	Mean of 19A and 19B.	Total.	Total.	Scotch Pig. s. and d. per ton	Bars, Common. £ per ton	Chili Bars. £ per ton	English Tough Cake. £ per ton	Straits. £ per ton
1884........		6¼	11·78	—	—	—	42·1	5⅝	54	59	81
'85........		6½	12·06	—	—	—	41·10	4⅞	43	47	87
'86........		6⅛	11·77	—	—	—	39·11	4⅝	40	44	98
'87........	Prices, see preceding page, 18A and 18B.	5	10·58	—	—	—	42·3	4⅜	44	47	112
'88........		4	10·99	—	—	—	39·11	4⅞	81	78	117
1889........		4¼	10·79	—	—	—	47·9	6¼	51	54	93
'90........		4½	10·65	—	—	—	49·7	6⅜	54	59	94
'91........		5½	10·70	—	—	—	47·2	5⅝	51	55	91
'92........		4⅞	10·07	—	—	—	41·10	5½	45	48	93
'93........		5⅜	9·74	—	—	—	42·4	5	44	47	85
1894........		4¼	9·59	—	—	—	42·8	4⅞	40	43	68
'95........		4⅛	9·63	—	—	—	44·5	4⅞	43	46	63
'96........		4	9·55	—	—	—	46·10	5	47	50	60
'97........		4	9·36	—	—	—	45·4	5¼	49	52	62
'98........		4½	9·10	—	—	—	47·2	5½	52	55	72
Average 1888-97		4½	10¼	—	—	—	45	5⅜	50	53	83
'78-87		6½	12¾	—	—	—	46	5½	55	60	89
'67-77		11¼	17¼	—	—	—	69	8¼	75	81	105

Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

		*	*								
1884........	73	56	68	62	253	1,501	61	62	72	—	77
'85........	65	58	70	64	250	1,414	60	59	57	—	83
'86........	75	58	69	64	239	1,370	58	56	53	—	93
'87........	113	44	62	53	269	1,336	61	56	59	—	107
'88........	96	36	64	50	259	1,370	58	59	108	—	111
1889........	114	38	63	50	300	1,421	69	76	68	—	89
'90........	123	40	62	51	282	1,382	72	77	72	—	90
'91........	118	49	62	56	285	1,454	68	68	68	—	87
'92........	113	43	59	51	278	1,387	61	66	60	—	89
'93........	123	48	57	53	299	1,360	61	61	59	—	81
1894........	117	38	56	47	260	1,259	62	59	53	—	65
'95........	115	37	56	47	247	1,224	64	59	57	—	60
'96........	100	36	56	46	236	1,173	68	61	63	—	57
'97........	86	36	54	45	209	1,243	66	64	65	—	59
'98........	78	40	53	46	205	1,285	68	67	69	—	69

* Index numbers not included in the general average.

Average Prices of Commodities—Contd.

No. of Article	24	25	26	20—26	27	28	29A	29B	30A	30B	31
	Lead.	Coals.			Cotton.		Flax.		Hemp.		Jute.
Year.	English Pig.	Wallsend Hetton in London	Average Export Price.	Minerals. Total.	Middling American.	Fair Dhollerah.	St. Petersburg.	Russian, Average Import.	Manila Fair Roping.	St. Petersburg Clean.	Good Medium.
	£ per ton	s. per ton	s. and dec. per ton		d. per lb.	d. per lb.	£ per ton	£ per ton	£ per ton	£ per ton	£ per ton
1884	11¼	16½	9·29	—	6	3 15/16	29½	30¾	38	29	13½
'85	11⅝	16½	8·95	—	5⅝	4¼	34	35	35	29	12
'86	13¼	16	8·45	—	5⅛	3 9/16	35	35	29	29	11½
'87	12⅞	16	8·32	—	5½	3 9/16	32	31½	34	29	12¼
'88	13⅞	16½	8·41	—	5 9/16	3⅞	29	28	37	26	13¼
1889	13	17½	10·21	—	5 15/16	4⅛	28	28	50	26	15
'90	13¼	19	12·62	—	6	3 15/16	27	26	39	26	13¼
'91	12½	19	12·16	—	4 11/16	3¼	28	26	32	24	13
'92	10⅝	18½	11·04	—	4 3/16	3	28	26	28	24	15
'93	9¾	19½	9·90	—	4⅝	3 9/16	34	31½	26	24	13
1894	9⅝	16½	10·50	—	3 13/16	2⅝	32	33	22	24	12½
'95	10¾	15	9·33	—	3 27/32	2⅜	26	28	19	25	11
'96	11½	15	8·85	—	4 11/32	3 3/32	26	27	17½	25	12¼
'97	12⅝	15⅝	8·98	—	3 29/32	3 1/32	24½	27	16	25	11
'98	13¼	16¾	9·92	—	3 5/16	2½	24	25½	27	25	11
Average 1888-97	12	17¼	10¼	—	4 11/16	3 5/16	28	28	28½	25	13
'78-87	14	16¾	9	—	6	4¼	33	34	35½	26½	15
'67-77	20½	22	12½	—	9	6¾	46	48	43	35	19

Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

Year	24	25	26	20—26	27	28	29A–29B		30A–30B		31
1884	55	75	74	476	67	59	64		86		71
'85	57	75	72	463	62	63	73		82		63
'86	65	73	68	466	57	53	75		74		61
'87	63	73	67	486	62	53	68		81		64
'88	68	75	67	546	62	58	61		81		70
1889	63	80	82	527	66	61	60		97		79
'90	65	86	101	563	67	58	56		82		70
'91	61	86	97	535	52	48	57		72		68
'92	52	84	88	500	46	45	57		67		79
'93	48	89	80	479	51	53	70		64		68
1894	47	75	84	445	42	39	69		59		66
'95	52	68	75	435	43	41	57		56		58
'96	56	68	71	444	48	46	56		55		64
'97	62	72	72	460	43	45	55		53		58
'98	65	76	79	493	37	37	52		67		58

Average Prices of Commodities—*Contd.*

No. of Article	32A	32B	33	34	27—34	35A	35B	36	37A	37B	38
	Wool.			Silk.		Hides.		Leather.	Tallow.		Oil.
Year.	Merino, Port Phillip, Average Fleece.	Merino, Adelaide, Average Grease.	English, Lincoln Half Hogs.	Tsatlee.	Textiles. Total.	River Plate, Dry.	River Plate, Salted.	Crop Hides, 30–45 lbs.	St. Petersburg, Y.C.	Town.	Palm.
	d. per lb.	*d.* per lb.	*d.* per lb.	*s.* per lb.		*d.* per lb.	*d.* per lb.	*d.* per lb.	*s.* per cwt.	*s.* per cwt.	£ per ton
1884	18¼	8⅛	10	14½	—	9	7	15	47	37½	36
'85	16½	6¾	9⅞	12⅜	—	8¼	6½	15	38	30½	30
'86	15½	6⅝	10	13¾	—	8	5¾	15	31	26	24
'87	15¾	7	10⅝	14½	—	7¾	6¼	15	31	24	22
'88	15¾	7	10⅜	13	—	6¾	4⅞	14	36	28	22
1889	17½	8¼	11	13½	—	6¼	5	13½	38	27	25
'90	16	7½	11	14	—	5¾	5½	13	38	26	27
'91	14¾	6⅞	9¼	13	—	5½	5⅛	13	40	27½	26
'92	13	6	8¾	12¼	—	5½	4⅜	13	45	27	24
'93	12¾	6	10¼	12½	—	5½	4⅞	13	48	30½	28
1894	11¾	5⅜	10⅛	10	—	5½	4¾	12½	48	25½	24½
'95	12	5⅝	12	10	—	7½	6¼	13½	48	23	23
'96	13	6⅜	11½	10½	—	6¾	5½	13½	48	21	22
'97	12½	6	9⅝	10¼	—	6½	5½	13½	40	20	22
'98	13¼	6⅝	8¾	10½	—	7	6⅛	13½	40	22	23
Average											
1888–97	14	6½	10½	12	—	6⅛	5¼	13½	43	25½	24½
'78–87	18½	8⅜	11¾	15	—	8⅜	6¾	15	41	35½	32½
'67–77	21¼	9⅞	19¾	23	—	9	7	16	45	45	39

Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

Year	32A–32B	33	34	27—34	35A–35B	36	37A–37B	38
1884	85	51	63	546	100	94	94	92
'85	73	50	55	521	95	94	76	77
'86	70	51	60	501	85	94	63	61
'87	72	54	63	517	88	94	61	56
'88	72	53	57	514	73	87	71	56
1889	82	56	59	560	70	84	72	64
'90	76	56	61	526	70	81	71	69
'91	70	49	57	473	66	81	75	67
'92	61	44	53	452	63	81	80	61
'93	60	52	54	472	65	81	87	72
1894	55	51	43	424	64	78	82	63
'95	57	61	43	416	84	84	79	59
'96	62	58	46	435	77	84	77	56
'97	59	49	45	407	75	84	67	56
'98	64	44	46	405	82	84	69	59

Average Prices of Commodities—Contd.

No. of Article	39	40A	40B	41	42	43	44	45A	45B	35—45	20—45	1—45
	Oil		Seeds.	Petroleum.*	Soda.	Nitrate of Soda.	Indigo.	Timber.		Sundry Materials Total.	Materials Total.	Grand Total.
Year.	Olive.	Linseed.	Linseed.	Refined.	Crystals.		Bengal, Good Consuming.	Hewn, Average Import.	Sawn or Split, Average Import.			
	£ per tun	£ per ton	s. per qr.	d. per gall.	s. per ton	s. per cwt.	s. per lb.	s. per load	s. per load			
1884........	40	20	43	6¼	65	9½	6	48	46	—	—	—
'85........	39	22	44	6⅞	55	10½	5¼	48	45	—	—	—
'86........	38	20½	42	5⅞	49	10	5	43	43	—	—	—
'87........	34	20½	38	5⅜	50	9½	4¾	38	42	—	—	—
'88........	36	18½	39	6½	48	10	4¾	41	44	—	—	—
1889........	35	20	42	5¾	51	9½	4½	47	49	—	—	—
'90........	41	23	43	5½	61	8½	4¼	44	46	—	—	—
'91........	43	21	42	5⅝	64	8¾	4¾	40	43	—	—	—
'92........	36	18½	39	5	66	8¾	4½	40	44	—	—	—
'93........	36	20½	42	4	58	9¼	5½	38	43	—	—	—
1894........	35	20¼	38	3⅞	42	9¼	5	36	44	—	—	—
'95........	36	20¼	37	6	39	8¼	4¼	37	42	—	—	—
'96........	30	17½	33	5½	42	8	4¼	40	44	—	—	—
'97........	31	15	33	4¾	51	7¾	4	41	47	—	—	—
'98........	32	16¾	36	5⅝	54	7¼	3½	42	47	—	—	—
Average 1888–97	36	19½	39	5¼	52	8¾	4½	40½	44½	—	—	—
'78–87	40	23	46	6⅞	62	12½	6	47	47	—	—	—
'67–77	50	30	60	12½*	92	14	7¼	60	54	—	—	—

Index Numbers (or Percentages) of Prices, the Average of 1867-77 being 100.

Year	Oil (39, 40A)	41*	42	43	44	Timber (45A, 45B)	35—45	20—45	1—45
1884........	80 · 69	52	71	68	83	82	885	1,907	3,408
'85........	78 · 73	55	60	75	72	81	836	1,820	3,234
'86........	76 · 69	47	53	71	69	76	764	1,731	3,101
'87........	68 · 65	45	54	68	66	70	735	1,738	3,074
'88........	72 · 63	52	52	71	66	74	737	1,797	3,167
1889........	70 · 69	46	55	68	62	84	744	1,831	3,252
'90........	82 · 73	45	66	61	59	79	756	1,845	3,227
'91........	86 · 70	45	70	63	66	73	762	1,770	3,224
'92........	72 · 64	40	72	63	62	74	732	1,684	3,071
'93........	72 · 69	32	62	66	76	71	753	1,704	3,064
1894........	70 · 65	31	46	66	69	70	704	1,573	2,832
'95........	72 · 64	48	42	59	59	69	719	1,570	2,794
'96........	60 · 56	44	46	57	59	74	690	1,569	2,742
'97........	62 · 53	38	56	55	55	77	678	1,545	2,788
'98........	64 · 59	41	59	55	48	78	698	1,596	2,881

* Petroleum as compared with the average from 1878-77 only.

VII.—*Fires in London and the Metropolitan Fire Brigade in* 1898.

THE following particulars are taken from the Report of the Chief Officer of the Fire Brigade Committee of the London County Council, in continuation of similar notices for former years:—

The report begins with a comparison of the brigade work since 1866. The figures for the last five years are:—

Number of Fires.

Year.	Serious.	Slight.	Total.
1894..................	151	2,910	3,061
'95..................	142	3,491	3,633
'96..................	122	3,494	3,616
'97..................	168	3,332	3,500
'98..................	205	3,380	3,585

" Since 1896, for purposes of comparison, I have taken the water supply as a basis in obtaining my definition of a serious fire, and any fire requiring more than one hydrant for its extinction is now classed as such. This table is not affected by loss of life.

" These cases of fire entailed the turning out of brigade men and appliances for work in extinguishing fires, and do not include chimney fires and false alarms.

" The number of fires in which life has been endangered is 164; the number in which a loss of life has occurred is 85; observing that in this calculation a life is said to be endangered when the person alluded to left the house by irregular means.

" The number of persons whose lives were endangered is 225. Of these 127 were saved, the remaining 98 lost their lives.

" Of the 98 cases of death from fire, the large majority of these deaths occurred before the fire brigade was even called. In many cases death occurs when the fire in question is exceedingly limited, and the only information the brigade obtains is from the police, perhaps some hours after the occurrence.

" Undoubtedly we are receiving earlier intimation of fire generally, and the local authorities are interesting themselves to our benefit considerably in the matter, by painting red the lamp posts, and otherwise indicating the positions of the fire-alarms. Yet it is astonishing what a very large majority of householders, who are well acquainted with the position of the pillar letter box, are utterly ignorant of the position of the nearest fire alarm. Again, having during the year made a study in this direction, I find that a very large number of people are still of opinion that the services of the fire brigade have to be paid for. This results in householders attempting to deal with a fire themselves, leaving

the brigade to be called by a casual observer of the fire from the outside.

"The committee will know that, with an average of 10 fires per day, it is impossible, in London, for me to give any estimate of either the property at risk or the damage done, but, without doubt, the facilities the committee has provided for the better mobilisation of the brigade are showing a marked effect. This is indirectly seen in the increased number of 'so called' *serious* fires, as regards which it must be remembered that the *serious* fire is so described when more than 1 hydrant is used at a fire occurrence. I am convinced that 1898 has been a satisfactory year from the brigade point of view.

"Last year the brigade was called for chimneys on fire in 1,563 instances, of which 555 were false alarms.

"The false alarms received to fires numbered 830, of which 270 were maliciously given, but only 9 persons were brought to punishment. In addition, 9 persons who, for malicious or other reasons, broke the covering glass of alarm posts without giving the alarm, were apprehended and dealt with as shown in this report.

"I hope that the magistrates and the police will be able to assist us in reducing the very large number of these malicious alarms, which tend to have a far greater effect on the efficiency of our work than many would imagine; observing that to effectually prevent this wanton misuse of appliances for the public safety, the public themselves are to a great extent responsible, and could materially, by their vigilance, stop it.

"There have been 9 cases in which the water arrangements have not been satisfactory. All these have been duly reported.

"During the past year I have been called upon to report to other committees of the Council upon matters affecting my department. The number of new theatres now being erected within the county of London has caused considerable labour under this head. The actual number of reports (the preparation of which involved, in many cases, several inspections of premises) to committees, other than the fire brigade committee, has been as follows:—

Theatres committee	32
Building Act committee	22
Public control committee	2
Total	56

"The strength of the brigade is as follows:—

Staff.

911 firemen, including chief officer, second officer, superintendents, and all ranks.
32 men under instruction.
17 pilots.
125 coachmen.

1 mechanical engineer.
3 storekeepers.
5 clerks.
1 artificer.
22 mechanics and labourers.

Material and Duties.

61 land fire engine stations, with horses.
4 floating or river stations.
1 sub-station without horses.
17 permanent street stations.
31 horsed escaped duties.
46 hose cart duties.
9 hose and ladder truck duties.
137 hand fire escape duties.
8 steam fire engines on barges.
60 land steam fire engines.
39 six-inch manual fire engines.
7 under six-inch manual fire engines.
6 hose tenders and escapes.
12 „ and ladder trucks.
113 „ carts.
40 miles of hose.
7 steam tugs.
12 barges.
12 skiffs.
213 hand fire escapes.
3 emergency ladders.

11 long fire ladders.
33 ladder vans.
2 trollies for engines.
6 hose and coal vans.
6 traps for visiting.
3 stores vans.
1 canteen van.
2 waggons for street duties.
4 bicycles.
133 watch boxes.
211 horses.
108 telephone lines between fire stations.
600 fire alarm call points.
16 telephone lines to police stations.
116 telephone lines to public and other buildings.
8 bell-ringing fire alarms to public and other buildings.
1 speaking tube to public and other buildings.

" The committee will remember that during the past year I have been allowed to do a large amount of useful work in the direction of advising the city authorities, the heads of government departments and public institutions, as regards the protection from fire of their buildings and the inmates thereof. The only conditions on which these services have been rendered were that neither the Council nor I accepted any responsibility or fee.

" The number of accidents to members of the brigade recorded during 1898 is 148; none of these have been fatal.

" There have been during the year 421 cases of ordinary illness, 4 of which resulted in death.

" The total number of officers and men struck off the strength of the brigade during the year is 81."

The following particulars are obtained from the tables appended to the report, viz.: fires classified according to occupations, and arranged in the order of frequency of occurrence; to which are added, for the purpose of comparison, the corresponding figures for the three previous years :—

Number.	Occupations.	Number of Fires in			
		1898.	1897.	1896.	1895.
1	Private houses	896	900	949	1,003
2	Lodgings...............................	780	726	801	726
3	Victuallers	70	81	83	81
4	Oil and colour men	61	37	53	46
5	Commons, roads, and open spaces	58	67	70	62
6	Builders	51	34	48	40

Number.	Occupations.	Number of Fires in			
		1898.	1897.	1896.	1895.
7	Confectioners and pastrycooks..................	48	42	45	40
8	Unoccupied......................................	46	39	56	50
9	Printers and publishers	45	36	31	36
10	Under repair and building	44	46	37	33
11	Tailors, clothiers, and outfitters	41	41	39	34
12	Restaurants and refreshment rooms	39	35	29	23
13	Greengrocers and fruiterers	36	38	35	44
14	Grocers	34	38	29	61
15	Offices	33	40	42	36
16	Boot and shoe makers	33	35	37	48
17	Railways	33	16	27	25
18	Cabinet makers	32	29	43	28
19	Chandlers	31	21	28	24
20	Coffee-houses	30	26	35	33
21	Drapers	28	40	39	33
22	Butchers..	26	38	18	26
23	Tobacconists	25	24	24	30
24	Hairdressers	25	20	28	28
25	Laundries	24	27	13	20
26	Stables...	23	15	14	27
27	Hotels (including club-houses)	22	31	30	23
28	Bakers...	22	29	26	32
29	Provision dealers	22	28	25	23
30	Contractors........	21	19	13	12
31	Engineers and machinists.........................	20	35	22	12
32	Dairymen	19	16	14	19
33	Fried fish shops..................................	18	24	20	22
34	Chemists..	18	23	21	13
35	General dealers	17	16	23	15
36	Waggons on the road	15	20	18	5
37	Furniture makers and dealers	15	19	24	21
38	Churches and chapels	15	9	15	13
39	Let out in tenements	14	12	7	10
40	Corn dealers	13	16	13	20
41	Schools	13	13	4	12
42	Booksellers, binders, and stationers...........	12	15	15	16
43	Fishmongers	12	13	20	15
44	China and glass dealers	12	12	12	9
45	Milliners and dressmakers	11	14	15	10
46	Farming stock	11	5	9	16
47	Hatters	11	4	8	8
48	Looking glass and picture frame makers	11	9	5	2
49	Surgeons..	11	6	5	11
50	Wardrobe dealers	11	5	13	12
51	Soot merchants	10	9	8	8
52	Wine and spirit merchants	10	6	6	10
		2,978	2,899	3,044	3,006
	Remainder	607	601	572	627
		3,585	3,500	3,616	3,633

Fires classified under the causes to which they have been assigned, and arranged in the order of frequency of occurrence :—

Causes.	Number of Fires.
1. Unknown and doubtful..	1,154
2. Lamps (not gas) and lights thrown down	725
3. Gas in various ways	290
4. Sparks from fires, &c.	241
5. Candles	239
6. Defective or improperly set flues, hearths, stoves, &c.	198
7. Children playing with fire, matches, &c.	166
8. Hot ashes	100
9. Overheating of flues, ovens, furnaces, boilers, &c........................	82
10. Airing linen and drying stoves	73
11. Boiling over, or upsetting of fat, pitch, &c.	56
12. Mineral oil stoves, explosion or upsetting of...............................	55
13. Foul flues, &c.	38
14. Overheating of portable gas stoves, &c......................................	38
15. Lucifer matches..	18
16. Clothes or goods	17
17. Vapour of spirit in contact with flame	12
18. Smoking tobacco	11
19. Lime slaking by rain and otherwise	8
20. Burning rubbish	8
21. Fireworks, letting off	6
22. Spontaneous ignition...	6
23. Lighted taper	5
24. Electric wires, short circuit of..	4
25. Friction of machinery	4
26. Fumigating	4
Miscellaneous, varying from 3 to 1	27
Total	3,585

VIII.—*English Literature in* 1898.

THE following particulars are taken from the *Publishers' Circular* of the 7th January, 1899, in continuation of a series of similar extracts for previous years :—

" Whether it be owing to wars and political excitements, or to a diminishing energy on the part of authors, the output of new books and new editions has declined, the number for 1898 being

410 less than in 1897. It is nearly 1,000 more than in 1896. Law and miscellaneous are the only two classes in which the total numbers show an increase. In the case of law the increase is a score ; and there is double that increase in the case of *new* educational works, while there is a decrease of a like number in educational reprints. The increase of 200 in miscellaneous works is partly accounted for by the fact that pamphlets have been unusually numerous.

"It should be said that this table does not include books published in America and not also published in England, nor books of which the prices have been altered, though the notice of such has filled considerable space in the columns of the *Publishers' Circular* during the year. Of works published in the United States only we have recorded in our weekly lists during the past year 397 ; of works reduced in price, 159; and of works of which the price has advanced, 31.

"The analytical table is divided into thirteen classes; also new books and new editions.

Divisions.	1897.		1898.	
	New Books.	New Editions.	New Books.	New Editions.
Theology, sermons, biblical, &c...............	594	109	535	153
Educational, classical, and philological....	692	236	732	189
Novels, tales, and juvenile works	1,960	717	1,758	644
Law, jurisprudence, &c.	93	47	117	46
Political and social economy, trade, &c..	531	110	437	97
Arts, sciences, and illustrated works........	288	30	263	32
Voyages, travels, geographical research ..	173	48	133	59
History, biography, &c.	604	141	618	125
Poetry and the drama...............................	298	129	290	81
Year-books and serials in volumes	422	—	347	—
Medicine, surgery, &c.	152	59	160	36
Belles-Lettres, essays, monographs, &c.....	227	48	182	36
Miscellaneous, including pamphlets, not sermons	210	8	436	30
	6,244	1,682	6,008	1,508
	7,926		7,516	

Analytical Table of Books Published in 1898.

Subjects.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total of Books on each Subject for the Year.
Theology, sermons, biblical	* 29	44	46	57	46	38	35	22	24	80	58	56	535
	† 11	25	15	8	22	8	13	5	5	10	18	13	153
													688
Educational, classical, and philological	* 54	83	62	67	60	50	53	30	58	98	54	63	732
	† 26	32	18	15	24	6	15	5	5	21	12	10	189
													921
Juvenile works, novels, tales, and other fiction	* 71	103	129	138	118	109	90	68	135	376	243	178	1,758
	† 30	51	46	51	53	45	54	40	51	106	69	48	644
													2,402
Law, jurisprudence, &c.	* 5	15	12	15	8	7	8	10	6	6	10	15	117
	† 5	4	3	3	4	7	1	6	1	6	3	3	46
													163
Political and social economy, trade, and commerce	* 31	30	35	40	34	40	43	20	30	50	37	47	437
	† 10	7	10	11	6	6	7	3	3	9	15	10	97
													534
Arts, science, and illustrated works	* 16	24	18	23	20	23	27	9	10	10	30	53	263
	† 1	6	2	2	5	3	6	2	—	1	2	2	32
													295
Voyages, travels, geographical research	* 14	15	14	29	15	9	6	1	2	3	7	18	133
	† 4	2	5	6	7	3	2	—	—	2	3	5	39
													172
History, biography, &c.	* 50	72	49	54	58	40	35	21	35	79	54	71	618
	† 14	18	16	10	6	12	3	5	12	16	2	11	125
													743
Poetry and the drama	* 15	24	24	25	25	19	19	12	21	32	31	43	290
	† 8	8	5	5	8	7	3	1	1	11	16	8	81
													371
Year-books and serials in volumes	* 50	38	23	20	20	19	18	11	22	40	32	54	347
	† —	—	—	—	—	—	—	—	—	—	—	—	
													347
Medicine, surgery, &c.	* 11	14	18	15	15	9	15	7	10	14	17	15	160
	† 2	2	3	1	4	5	1	3	4	2	4	5	36
													196
Belles-Lettres, essays, monographs, &c.	* 11	15	11	16	12	6	15	7	17	20	25	27	182
	† 7	—	—	4	1	1	2	2	5	1	7	6	36
													218
Miscellaneous, including pamphlets, not sermons............	* 11	31	28	42	45	35	56	39	19	53	40	37	436
	† 2	2	1	1	7	5	6	—	—	2	3	1	30
													466
	488	665	593	658	623	512	533	329	476	1,048	792	799	
													7,516

* New books.   † New editions.

IX.—*Notes on Economical and Statistical Works.*

Principles of Economics. By Alfred Marshall. Vol. i (4th edition), 1898. 820 pp., 8vo. London: Macmillan and Co.

In issuing a fourth edition of his first volume, Professor Marshall has endeavoured to meet the views of critics and to render his work more useful to students of all classes, academic and other. Those who desire to omit the more abstruse and intricate portions of the reasoning, will be assisted by finding those parts marked off by special type. The changes on the whole, apart from this new feature, are not extensive. Perhaps the most important are those which relate to the study of quasi-rents, which no longer possess the power to distract readers by the occurrence of a strange title far from the place where that title is explained and discussed; and the changes aiming at making clearer the acknowledged difficulties of the problems in which increasing returns are of great importance. We express a very general feeling in saying that we trust that the persistent efforts of critics to obtain changes in the first volume, may not be stimulated by the generous yielding to them which must of necessity delay progress with the rest of the work.

The Shifting and Incidence of Taxation. By Edwin R. A. Seligman. Second edition. 337 pp., 8vo. $3 net. New York: The Macmillan Company, 1899.

At a time when problems of taxation, in more than one form, are likely to receive an increased share of attention in this country, the revised and enlarged edition of a work which is recognised as one of authority will be welcomed. The historical part of the treatise has been enlarged by a somewhat elaborate study of the earlier English writers on the subject, and other changes have been introduced which add to the value of the work. To those who are interested in proposals for the reform of local taxation, it will be of interest to know that Professor Seligman adheres to his conclusion that in respect of taxes like our local rates, "the main burden ... will rest ultimately on the occupier, not on the owner of the premises ...... It may be said that in a prosperous and progressive community the tax tends to fall chiefly on the tenant, while in decaying and unprosperous districts the tax tends to fall on the owner; but in all cases more of the tax will tend to be borne by the tenant when the tax is originally imposed on him, than when the tax is assessed on the owner." In respect of the subject of some of Professor Edgeworth's criticisms of the assumptions made, a difference still exists between these doctors which we do not propose to determine. In spite of any such differences, English students will owe a debt of gratitude to the Columbia Professor for providing so thorough and instructive a treatise, on a subject on which as yet they have to look more for help to foreign than to English writers.

The Bargain Theory of Wages. By John Davidson. 319 pp., crown 8vo. New York and London: Putman, 1898.

This little book is one of which a considerable part may be said to be a clear and useful statement of the relations between various factors concerned in that part of the work of distribution which affects hired labour. Up to a certain point Professor Davidson has contributed to a clear exposition of the problem of wages, and to the assignment of many theories to their proper place. We are obliged to him for putting in a clearer light, so far as we are concerned, the proposition that " a demand for commodities is not a demand for labour," without taking all force and meaning from that theorem as do some commentators. The theory which he constructs, however, does not commend itself to us. It appears to be lacking, in the sense that it is content to leave a considerable degree of indeterminateness about the amount of normal wages. An upper and a lower limit within which wages must fall are indicated, and between them the determination is left to the bargaining power of the parties concerned. Something of the same source of trouble affects, we think, this conclusion, as that which causes the author to refer in another part of the book to cases where demand alone is said to be concerned in determining value. In both cases there is a lack of completeness about the solution which is unsatisfactory. Can it be maintained that a state in which further labour would be worth more to an employer, than he would have to give to secure its aid, is one of permanence? Does not the author here pronounce judgment on one problem—the determination of normal wages— while thinking of another, namely, the outcome of a particular bargain, apart from its necessary consequences? Are there not influences at work which are tending to bring his upper and lower limits into coincidence?

Professor Davidson advances some evidence in support of the position that mobility of labour is not, in modern conditions, necessary to secure for the working classes the benefits of more effective competition, and that mobility is itself not desirable. Some of the figures he adduces are distinctly suggestive, and indicate that it might be worth while testing further the question of the relative advantages and disadvantages of mobility, but on the comparatively slight evidence he is able to produce, he does not persuade us to abandon a belief that the advantages of mobility turn the scale distinctly on their side. The cramped nature of his diagrams has possibly prevented them from appealing to us as strongly as to himself. A disproportionate amount of space is assigned in the volume to this discussion of mobility, and however interesting it may be in itself, it might be very substantially reduced with advantage to the general purpose of the book.

Methods of Industrial Remuneration. By David F. Schloss. Third edition, 1898. 446 pp., crown 8vo. 6s. 3d. net. Williams and Norgate.

In its new and revised form these studies relating to an important aspect of the wages question, already familiar to a large

number of readers, will be even more useful than in the older editions. New information is utilised, and some portions of the book are rearranged or rewritten. The invaluable store of material is made even more ready of reference at the same time as it is enriched by the additions made to it. In saying that there is a gain in clearness, we do not wish to suggest that there was any very striking need for change with that end in view, but merely to indicate the favourable impression conveyed by the new edition. The author's opinions are no less emphatic than previously as to the place of profit-sharing, while his more hopeful views, based on the actual facts, as to the future of industrial co-operation are worth noting.

Deutsche Wirtschaftsgeschichte in den letzen Jahrhunderten des Mittelalters. By Dr. Karl Theodor von Inama-Sternegg. Erster Teil. 455 pp., 8vo. Leipzig: Duncker and Humblot, 1899.

In presenting the first part of the third volume of his *Deutsche Wirtschaftsgeschichte* to the public by itself, Dr. Inama-Sternegg points out that it is complete even alone. It treats of subjects of great importance and of interest to no small circle of students. The first section is devoted to a description of the people whose industrial relations form the subject of the volume, as it was distributed when the great movements of population of the tenth to the twelfth centuries died away. The indications of the absolute and relative magnitudes of the greater German towns in the fourteenth or fifteenth centuries may be interesting to quote. The towns whose population exceeded 20,000 were extremely few. Of those which can be named with reasonable certainty, Nürnberg and Strassburg alone reached this figure. In the next scale of magnitude, namely, 10,000 to 20,000, not many can be named, Frankfurt-a-M., and Basel may just be included, possibly Rostock, Ulm and Zurich with some certainty. The towns where the head-quarters of the various princes were to be found were, for the most part, of from 5,000 to 10,000 inhabitants, while the great bulk of the German towns were of lesser magnitude. These towns manifested two features common enough now-a-days, a considerable excess of women over men, and a strong power of attraction from the surrounding rural districts, sometimes even from considerable distances.

Of the position of the peasant, we learn that the thirteenth and fourteenth centuries were most favourable for him. As in England, the black death in the middle of the fourteenth century favoured his class. But, otherwise than in our own country, in the greater part of northern Germany the fifteenth century witnessed a change for the worse. This was not the case, however, in the Tirol, and does not occur till the second half of the century in other parts of southern Germany.

The tracing of the growth of the industrial character of the town is of great interest, with the changing importance of the various classes of inhabitants, whilst at the same time we have our attention called to a characteristic purely agricultural element. In the long-continued conflicts between journeyman and master-

craftsman we have a feature which some have too hastily read into
our own history, following a practice which, though of great utility,
is not free from a power to mislead. Similarity does not always
exist where one expects that it should, as some of our more recent
economic historians have shown us. The history of German
towns and of the reasons for the influence they wielded is quite
sufficiently attractive of itself to make this part of Dr. Inama-
Sternegg's work interesting.

The following section treats of the land question, where again
are found both causes and effects of the influence of the free towns,
and on this subject the learned author dwells at some length.
There arise many points in connection with the land question on
which controversy of the keenest kind has prevailed, but we have
not space to touch on these, or to do more than mention the careful
and instructive description of the mode of management of the
land and of the various uses to which it was put, together with the
amount of produce that was yielded, and the mode in which
owner, cultivator, and other claimants divided the produce. Within
a moderate compass there is here provided for us a great amount
of information, accompanied by references to the sources from
which it is drawn; this moreover is presented in the eminently
readable form which is not a universal accompaniment of learning
in such a field of knowledge.

An appendix, or rather a series of appendices, contain in
tabular form some of the statistical information to which reference
is made in the course of the volume.

The British Taxpayer's Rights. By H. Lloyd Reid. 288 pp.
8vo. London: Fisher Unwin, 1898.

Following up a work entitled *The British Taxpayer and his
Wrongs*, published ten years previously under the *nom de plume* of
"Finance," Mr. Reid, in this volume, gathers together a consider-
able quantity of material bearing on taxation and its principles,
and, after comparing and criticising the views of very numerous
writers, English and foreign, and of various dates, sums up in
favour of a tax on accumulated wealth, as a desirable substitute
for existing complex tax systems. The portion of the volume
which is devoted particularly to questions of taxation, is preceded
by chapters which aim at explaining some of the fundamental
principles of value and the distribution of wealth. No lack of
condemnatory criticism of existing institutions is found in either
part of the work. We propose to confine ourselves to a few
remarks bearing on the later half of the volume.

In one of his fundamental propositions the author will not find
himself supported by the great bulk of expert opinion, namely,
where he conceives it to be both possible and desirable to take
the cost of the services rendered to him by government as the
measure of a citizen's contribution to public expenses. In his
criticisms of the various standards which have been advocated for
estimating "equality" of taxation, the hankering after a measure
corresponding with the "cost" idea,—itself not always kept clear

from confusion with the " benefit " rendered,—prevents him from seeing what was really the point of view of the writers he criticises. Confusion, in spite of most strenuous and apparent effort after clearness, is, in fact, a rather characteristic feature of the book. Consistency is, as a result, often sacrificed. One instance of confusion may be noted in the section on economic rent. Other writers have, in not rare cases, considered economic rent as specially suited for taxation, while recognising difficulties in practically taxing it. Our author, we almost think, holds this view, but somehow fails to recognise the fact because, although devoting separate sections to economic rent and ordinary rent, he really does not succeed in getting the two properly distinguished. We forbear from quoting the six canons which he lays down for a just and adequate tax system, even for the purpose of pointing out that they are hardly self-consistent. One point of considerable importance in the author's theory must, however, be noted. His mode of estimating the proportion of such a tax as that on spirits, to the value of the article, is to take the actual tax (in a case taken for example $6\frac{1}{2}$ times the value), to estimate that the goods are consumed within half-a-year, and to conclude that the rate of tax is 1300 per cent. per annum (even then the arithmetic goes wrong). In support of this position he quotes Dr. William Farr. We leave judgment as to the propriety of the mode of treatment to our readers.

As a justification of his property tax as a sole and desirable ultimate substitute for our present system, he quotes Hume to the effect that the property tax in the United States of America is assessed with exactitude and without serious difficulty. He might have found later information in abundance to the contrary effect. He further states : "The average tax rate on property in the United States, where customs duties chiefly maintain the small army and navy ordinarily employed, was $1·85 per cent. in 1888-89." Reference to the accounts of income and expenditure of the Federal Government for that year shows that one-half the income was from customs, and that this customs revenue exceeded three times the cost of the naval and military establishments for the year. If we are meant to infer from the author's statement that the main part of the expenses of government were met from a very moderate property tax, the conclusion does not seem to hold, especially as $1·85 per cent. on the capital value would be an onerous tax if assessed on the full value. Any one but slightly acquainted with the history of attempts to raise revenue by a general property tax, will have but little hope that any satisfactory result is likely to be reached by renewed attempts in that direction.

One reference in the course of the work is very striking, as a commentary on the recent proposals of the correspondent of the *Times* to tax sugar and corn. Noting the high authority of this our leading newspaper, and the sound judgment in matters such as he is discussing, displayed by its editors, he quotes some very emphatic pronouncements in 1859 and 1860 against that indirect taxation which now, alas, the *Times* commends.

La Costituzione Economica Odierna. Achille Loria. 822 pp., 8vo. 16 lire. Torino: Fratelli Bocca, 1899.

The great ability and the boldness displayed by Professor Loria in his former writings, invest this completion of what could only be slightly indicated in the *Analisi della Proprieta Capitalista* with more than ordinary interest. At great length and with much skill and learning the development of the conditions determining the division of wealth between labourer, capitalist, and landowner is worked out. The whole work turns on the effects of the appropriation of land and the increase of capital and population in leading to persistent increase of land values. To this universal phenomenon, traced in America and Australia as well as in European countries, is attributed the economic depression manifested in every part of the world. The economic organisation of our time does, however, the author emphatically states, present marks of striking superiority to the forms which have preceded it; in spite of this, in the perhaps not far distant future, the warring elements which constitute it must lead to a break-up of contemporary capitalism. If it be left to itself either the excessive accumulation of capital will bring about an economic revolution establishing free land, or the increase of population will cause a social revolution with the same result. To avert such a catastrophe as must supervene in either case the author proposes a plan which, if we understand it aright, amounts to making the transfer of land simple, and inducing workpeople to invest in plots of land the part of their wages not needed for their maintenance. The actual proposal is the payment of a part of wages in land. By this means the increase of land values will be checked and the evils it produces cured. An analogy from the case of slavery and the growth of value of slaves, which reached a point where slave labour became of little profit to the capitalist is traced. The author claims that the mode in which he proposes to avert the inevitable catastrophe which the continuance of present conditions must entail is superior to communism, and free from its dangers.

The extent of knowledge of economic writings in many languages shown by Professor Loria is not less in this than in former works. He has apparently gathered much information from the Royal Commission on Labour among other English sources. In the case of so extensive a work it is not possible to enter into any detailed criticism here. We note, however, that the determination of the rate of profit from the consideration of the marginal employment of capital is referred to as a grave error of Thünen, Jevons, Marshall, &c. If this difference of opinion is not due to the fact that the cases considered are not quite the same in the criticism and the doctrines criticised, we prefer the latter.

Welt-post Statistik; Telegraphen- und Telephon-verkehr, Postsparkassenwesen. Von Gottlieb Webersik. Leipsig: G. Freytag und Berndt.

This little volume contains full statistical details of the equipment, *personnel*, finances, and operations of the post offices

of the world. The number of missives of their several kinds dealt with by each in the course of the year is also shown. These and other particulars are afforded both absolutely in figures and relatively by means of a series of coloured diagrams constructed in a somewhat ingenious form. Each country is shown as to size according to the magnitude of its operations. But its place on the page is given it according to its geographical position, and thus it is easy to one who is ignorant of the extent of its postal business, to at once see how it stands. Particulars of telegraph work and statistics of the number of *employés* in each service are given, and the information will, placed as it is in a handy and accessible form, doubtless be useful to those who are interested in the question of the modern progress of inter-communication.

Statistical and Economical Articles in Recent Periodicals.

UNITED KINGDOM—

Economic Journal. December, 1898—Old Lights and New in Economic Study : *J. Bonar.* Rectification of Municipal frontiers : *W. M. Acworth.* Industrial Conciliation : a retrospect : *L. L. Price.* Comparison of the changes in wages in France, the United States, and the United Kingdom from 1840 to 1891 : *A. L. Bowley.* Has Co-operation introduced a new principle into Economics? : *C. Gide.* The Expenditure of Middle Class Working Women : *C. E. Collet.* Herr von Kaufmann and the French Railway System : *W.M.A.* Economic aspects of the Liquor Problem and Railway Brotherhoods in the United States : *C. Osborn.* Monetary reform in the United States : *F. M. Taylor.*

Economic Review. January, 1899—Foreign competition in relation to the New Trades Combination Movement : *E. J. Smith.* The Economics of Bargaining : *J. A. Hobson.* Co-operative Ideals : *H. W. Wolff.* A plea for the study of Economic History : *Rev. W. Cunningham.*

UNITED STATES—

Annals of the American Academy of Political and Social Science. January, 1899—The Growth of Great Cities : *E. J. James.* The Final Report of the [Indianapolis] Monetary Commission : *F. A. Cleveland.* Wealth and Welfare. II : *H. H. Powers.*

American Economic Association. Economic Studies—
 Vol. iii, No. 6—State Purchase of Railways in Switzerland : *H. Micheli.*
 Vol. iv, No. 1—The Relation between Economics and Politics : *A. T. Hadley.* Report of Committee on Currency Reform. Report of Committee on the Twelfth Census.

Columbia University. Studies in History, Economics, &c. Vol. x, No. 2—Rhode Island and the Formation of the Union : *F. G. Bates.*

UNITED STATES—*Contd.*

Johns Hopkins University Studies—

Series xvi, No. 12—Jared Sparks and Alexis de Tocqueville: *H. B. Adams.*

Series xvii, Nos. 1, 2, 3—History of State Banking in Maryland: *A. C. Bryan.*

American Statistical Association. Publications, 1898—

September—Comparative statistics of Railroad Rates: *H. H. Swain.* Comparative statistics of Railroad Service under different kinds of control: *C. E. Prevey.*

December—Considerations in gathering Forestry Statistics: *B. E. Fernow.*

Journal of Political Economy. December, 1898—Spanish Currency: *A. de Foville.* Socialism in France: *G. François.* The Measure of the value of money according to European Economists: *G. M. Fiamingo.* The Quantity Theory of money from the Marxist standpoint: *A. P. Hazell.* Stable Money: *T. E. Will.* Sugar Importations and Revenues: *F. L. McVey.* The Transition to Gold in England and in India: *W. W. Carlile.*

Political Science Quarterly. December, 1898—Imperialism?: *Prof. F. H. Giddings.* Railroad Control in Nebraska: *Prof. F. H. Dixon.* Land Tenure in Ancient India: *Prof. W. Hopkins.*

Quarterly Journal of Economics. January, 1899—A Collectivist Philosophy of Trades Unionism: *E. Cummings.* The United States Treasury in 1894-96: *F. W. Taussig.* What ought to be called Money?: *A. P. Andrew.*

Yale Review. February, 1899—The Socialistic Municipalities in Northern France: *L. S. Rowe.* Dynamic standard of Wages: *J. B. Clark.* Value and its measurement: *D. J. Green.* The Coin Shilling of Massachusetts Bay. II: *W. G. Sumner.* Workmen's Compensation Acts: *M. F. Tyler.* Denmark and its Aged Poor: *A. W. Flux.*

FRANCE—

Annales des Sciences Politiques. January, 1899—Les Associations en Chine: *M. Courant.* La loi belge de 1898 sur les Syndicats: *E. Van der Smissen.*

Journal de la Société de Statistique de Paris—

December—La dépopulation dans l'Orne: *A. Dumont (concluded).* Chronique des questions ouvrières et des assurances sur la vie: *M. Bellom.*

January—L'État économique et financier de l'Indo-Chine et l'organisation d'un service de statistique dans ce pays: *M. Doumer.* Du mouvement de la natalité pendant une période récente de vingt années: *L. L. Vauthier (concluded in February).*

February—Les tableaux officiels ou privés des faits que relève la statistique portent-ils la trace des événements historiques, politiques et économiques?: *C. Juglar.* Le fonctionnement de l'assurance en Turquie: *E. Rochetin (concluded in March).*

FRANCE—*Contd.*

 Journal de la Société de Statistique de Paris—Contd.

  March—Les émissions et remboursements en 1898, d'obliga-
tions de chemins de fer: *A. Neymarck.* Les banques au
Japon: *P. des Essars.* Étude sur les causes de progression
de la criminalité des enfants: *M. Albanel.*

 Journal des Économistes, 1899—

  January—La concentration du Trafic de Banque en Allemagne:
A. E. Sayous. A quoi tient l'infériorité actuelle des
Français: *M. Rouxel.*

  February—La vraie et la fausse coöpération: *Y. Guyot.* La
viticulture française en présence de la baisse des vins:
P. Pozzi-Escot. Le mouvement agricole: *L. Grandeau.* La
vraie solution de la Question juive: *F. Passy.* Le dixième
congrès des Banques populaires: *G. François.*

  March—Du taux actuel de l'intérêt et de ses rapports avec la
production des métaux précieux et les autres phénomènes
économiques: *R. G. Lévy.* Les dépenses militaires actuelles
de la France et de l'Allemagne: *G. Moch.*

 La Réforme Sociale. Nos.—

  68—Essai de recensement des employés et fonctionnaires de
l'état: II. Les retraités de l'état: *V. Turquan.*

  69—La politique commerciale de l'Allemagne et son influence
sur la situation sociale du pays: *G. Blondel.* Les habitations
ouvrières à Berlin: *A. Nérincx.*

  70—Sur le logement des classes laborieuses: *C. Hardy.*

  71—Les asiles de nuit et l'assistance par le travail: *L. Rivière.*
Comment réconcilier l'église et l'état: *H. Mazel.*

  72—La petite bourgeoisie d'après une enquête officielle à
Gand: *O. Pyfferoen.*

  73—Le travail des enfants de 12 à 14 ans en Allemagne dans
la loi et dans le fait: *V. Brants.* Les Corporations
d'étudiants en Allemagne: *H. Primbault.*

 Revue d'Économie Politique—

  December—Ce que coutent et ce que rapportent les Départe-
ments au budget de la France: *V. Turquan.* Le commerce
extérieur et la navigation de la France en 1897: *M. Zablet.*
La réforme de la circulation monétaire en Russie: *N. Fan-
Jung.*

  January—Si les institutions sociales sont un mal social?:
Ch. Gide. Les nouvelles compagnies ouvrières: *M. Waton.*

  February—L'Assurance ouvrière obligatoire: *R. Jay.* Pre-
miers effets de la loi anglaise sur les accidents du travail:
H. Wolff. Les banques allemandes en cas de crise ou de
guerre: *A. E. Sayous.*

GERMANY—

 Archiv für Soziale Gesetzgebung und Statistik. Hefte 3 *und* 4—Das
Frauenstudium der Nationalökonomie: *Dr. H. Herkner.* Die
Schranken der kapitalistischen Landwirtschaft: *K. Kautsky.*
Die Anfänge der Frauenbewegung: *L. Braun.* Ansprüche
arbeitsunfähiger Arbeiter nach deutschem Gewerberecht:

GERMANY—*Contd.*

    Archiv für Soziale Gesetzgebung und Statistik—Contd.

        M. von Schulz. Die Statistik der Krankenversicherung im Deutschen Reich für das Jahr 1896: *Dr. E. Lange.* Der Vollzug des schweizerischen Fabrikgesetzes: *E. Naef.*

    Jahrbuch für Gesetzgebung, Verwaltung, &c., 1899. Heft 1—Die Urgeschichte der Familie, Mutterrecht und Gentilverfassung: *G. Schmoller.* Beiträge zur Geschichte und Theorie des Armenwesens. II: *E. Münsterberg.* Das Fabrikschulwesen im Königreich Sachsen: *M. Freiherrn v. Welck.* Die reichsgesetzliche Familienversicherung: *H. v. Frankenberg.* Die rechts- und staatswissenschaftliche Fakultät: *W. Hasbach.* Über das deutsche Geldwesen im Kriegsfall. I: *M. Ströll.* Die Reorganisation der französischen Fondsbörsen: *A. E. Sayous.* Staat und Stände Frankreichs in dem Jahrhundert der Bürgerkriege (1550—1660): *K. Breysig.* Eine vorgeschrittene Fabrikgesetzgebung: *R. Riedl.* Die Vorschläge zur Reform der Invaliditäts- und Altersversicherung: *G. v. Witzleben.*

    Jahrbücher für Nationalökonomie und Statistik—

        December—Die chinesischen Vertragshäfen, ihre wirtschaftliche Stellung und Bedeutung: *H. Schumacher (continued in January).* Die englischen Nachlasssteuern: *C. H. P. Inhülsen.* Die Reorganisation der französischen Produkten- und Warenbörsen: *A. E. Sayous.*

        January—Städtische Finanzen im Mittelalter: *W. Stieda.* Die Lage des Hausierhandels in Deutschland: *L. O. Brandt.* Die Spindeln in der deutschen Textilindustrie: *F. Zahn.*

        February—Zur Geschichte der Lehre von der Gravitation der Löhne nach gewissen Kostenbeträgen: *F. J. Neumann.* Die Abgabenfreiheit der deutschen Ströme und die deutsche Landwirtschaft: *V. Kurs.* Die erkenntnistheoretischen Grundlagen der Wahrscheinlichkeitsrechnung: *L. v. Bortkiewicz.* Das Telephonwesen Schwedens: *A. Hemming.* Die Brotpreise in Berlin im Jahre 1898: *E. Hirschberg.*

    Vierteljahrshefte zur Statistik des Deutschen Reichs. 1899. Heft 1— Verunglückungen deutscher Seeschiffe in den Jahren 1896 und 1897. Die Eheschliessungen, Geburten, und Sterbefälle im Jahre 1897. Die Selbstmorde in den Jahren 1895 bis 1897. Zur Kriminal-Statistik für 1896.

    Zeitschrift für Socialwissenschaft, 1899—

        January—Die Grossindustrie im Altertum: *J. Beloch.* Der Einfluss der Ehe auf die Kriminalität des Mannes: *F. Prinzing (concluded in February).*

        February—Die Eroberung Kubas durch die Vereinigten Staaten und die Zukunft der europäischen Zuckerindustrie: *J. Wolf.*

    Zeitschrift für die gesamte Staatswissenschaft, 1899. Heft 1— Der Luxus in seinen Beziehungen zur Sozial-Oekonomie: *A. Velleman.* Die Regelung der Waldproduktion nach ihren gesamtwirtschaftlichen Nutzleistungen: *G. Wagener.* Der Trinkgeldernfug: *Dr. R. Zimmermann.* Die Lage des

GERMANY—*Contd.*

   Zeitschrift für die gesamte Staatswissenschaft, 1899—*Contd.*
      Schuhmacherhandwerks in Deutschland. I: *Dr. E. Fridrichowicz.*

AUSTRIA—

   Statistische Monatschrift. November—December, 1898—Der IX
      internationale Congress für Hygiene und Demographie in
      Madrid: *Dr. F. v. Juraschek.* Die österreichischen Assecuranz-
      Gesellschaften im Jahre 1896. II: *R. Krickl.*

ITALY—

   Rivista Italiana di Sociologia—
      November—L' utilità dello studio della storia economica: *W.
        Cunningham.* La sociologia e l' economia politica: *V. Tangorra.*
      January—Gerarchie sociali—Contributo alla teoria qualitativa
        della popolazione: *R. Benini.* Conseguenze sociologiche di
        recenti teorie sull' eredità: *G. Lerda.*
   Giornale degli Economisti. 1899—
      January—Le migrazioni del lavoro agli Stati Uniti d' America:
        C. Ottolenghi (*continued in March*). La prima breccia nel
        dazio consumo dei comuni italiani: *R. Dalla Volta.*
      February—Il profitto del capitale tecnico: *C. A. Conigliani*
        (*continued in March*). Gli operai italiani al Sempione:
        G. de Michelis.

RUSSIA—

   Bulletin Russe de Statistique financière. October—December,
      1898—La question de l'alcool et le monopole russe des
      spiritueux.—Production et consommation du vin en différents
      pays. Monopole russe des spiritueux.—Influence du monopole
      sur le chiffre de la consommation. Production du froment
      dans les cinq parties du monde. Recettes et dépenses budgét-
      aires des 8 premiers mois de 1897 et 1898. Production de la
      fonte en Russie pendant les 4 années 1894—1897. Budget de
      1899. Récolte de 1898.

SWITZERLAND—

   Journal de Statistique Suisse, 1899. *Heft* 2—Die Geschichte des
      schweizerischen Telephonwesens und die volkswirtschaftliche
      Bedeutung der schweizerischen Telephongesetzgebung: *Dr.
      P. Reinhard.* Die Mortalität an puerperalen septischen
      Prozessen in der Schweiz: *Dr. T. Perrin.* Über den Einfluss
      der Witterung auf Morbidität und Mortalität der Diphtherie
      in Basel, 1875-94: *Dr. M. Bollag.*

X.—*Quarterly List of Additions to the Library.*

*Additions to the Library during the Quarter ended 15th March, 1899,
arranged alphabetically under the following heads:*—(a) *Foreign
Countries;* (b) *India and Colonial Possessions;* (c) *United Kingdom
and its Divisions;* (d) *Authors, &c.;* (e) *Societies, &c. (British);*
(f) *Periodicals, &c. (British).*

The Society has received, during the past quarter, the current numbers—either
quarterly, monthly, or weekly—of the periodical official publications dealing
with the following subjects:—

Consular Reports—From Austria-Hungary, United States, and United
Kingdom.

Labour Reports, &c.—From Belgium, France, United States, New Zealand,
and United Kingdom.

Trade Returns—From Argentina, Austria-Hungary, Belgium, Bulgaria,
China, Egypt, France, Germany, Greece, Italy,
Mexico, Netherlands, Russia, Spain, Sweden, United
States, India, Canada, and United Kingdom.

Vital Statistics—From Argentina, Egypt, Germany, Italy, Netherlands,
Roumania, Switzerland, United States (Connecticut
and Michigan), Queensland, South Australia, and
United Kingdom.

Vital Statistics of following Towns—Buenos Ayres, Brünn, Prague, Brussels,
Berlin, Dresden, Hanover, Bucharest, Madrid,
Montevideo, London, Manchester, Dublin, Edinburgh,
and Aberdeen.

Donations.	By whom Presented (when not purchased).
(a) Foreign Countries.	
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Menger (*Anton*). The right of the whole produce of labour . . . Translated by M. E. Tanner, with introduction and bibliography by H. S. Foxwell. cxviii + 271 pp., 8vo. 1899	Messrs. Macmillan & Co.
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Cobden Club. The Cobden Club and the death of Mr. Thomas Bayley Potter. Official Report of the Annual Meeting of Members, 1898 . . . 80 pp., 12mo. 1898	The Club
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Professional Notes. Vol. ix, Part 3, 1899 .... } Transactions. (Current numbers)	} The Institution
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Accountant, The... Current numbers	The Editor
Accountants' Magazine, The .... ,,	,,
Athenæum, The .... ,,	,,
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Bankers' Magazine, The............................ ,,	,,
Bimetallist, The .... ,,	,,
British Trade Journal, The .... ,,	,,
Building Societies and Land Companies } Gazette.. } ,,	,,
Citizen, The.. ,,	,,
Colliery Guardian, The .... ,,	,,
Commercial World, The............................ ,,	,,
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Fireman, The .... ,,	,,
Incorporated Accountants' Journal .... ,,	,,
Insurance Post, The .... ,,	,,
,, Record, The .... ,,	,,
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Public Health .... ,,	,,
Sanitary Record, The .... ,,	,,
Shipping World, The................................ ,,	,,
Statist, The .... ,,	,,
"Statist's," The, History of the British Debt, showing } for each year from 1791 to 1898, amount of debt, } prices of "consols," &c. Mounted diagram, 1899........ }	The Editor, the Statist
Brewers' Almanack and Wine and Spirit Trade Annual } for 1899 .... }	Mr. Percy C. Morgan
Licensed Victuallers' Official Annual (6th year of issue) } for 1899. 8vo. .... }	Mr. Albert B. Deane
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Mitchell's Newspaper Press Directory for 1899....................	The Publishers
Post Magazine Almanack for 1899	,,

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XI.—PERIODICAL RETURNS.

REGISTRATION OF THE UNITED KINGDOM.

No. I.—ENGLAND AND WALES.

MARRIAGES—To 30TH SEPTEMBER, 1898.

BIRTHS AND DEATHS—To 31ST DECEMBER, 1898.

A.—*Serial Table of* MARRIAGES, BIRTHS, *and* DEATHS, *returned in the Years* 1898-92, *and in the* QUARTERS *of those Years.*

Calendar YEARS, 1898-92 :—*Numbers.*

Years	'98.	'97.	'96.	'95.	'94.	'93.	'92.
Marriages No.	—	248,843	242,764	228,204	226,449	218,689	227,135
Births........ ,,	922,873	921,104	915,331	922,291	890,289	914,572	897,957
Deaths .... ,,	552,040	541,426	526,727	568,997	498,827	569,958	559,684

QUARTERS *of each Calendar Year,* 1898-92.

(I.) MARRIAGES:—*Numbers.*

Qrs. ended last day of	'98.	'97.	'96.	'95.	'94.	'93.	'92.
March........ No.	45,079	44,618	43,266	39,627	47,809	40,243	42,835
June .... ,,	69,960	68,745	65,938	60,665	53,509	58,928	59,958
September ,,	66,393	65,897	65,057	61,048	60,062	58,539	58,264
December ,,	—	69,583	68,503	66,864	65,069	60,979	66,078

(II.) BIRTHS:—*Numbers.*

Qrs. ended last day of	'98.	'97.	'96.	'95.	'94.	'93.	'92.
March........ No.	232,145	235,711	222,672	239,615	228,862	231,133	219,999
June .... ,,	232,343	226,345	231,002	233,276	220,955	235,334	232,329
September ,,	234,665	233,090	228,558	232,410	215,851	229,396	228,771
December ,,	223,720	225,958	233,099	216,990	224,621	218,709	216,858

(III.) DEATHS:—*Numbers.*

Qrs. ended last day of	'98.	'97.	'96.	'95.	'94.	'93.	'92.
March........ No.	151,014	143,630	136,713	170,102	147,964	144,291	182,614
June .... ,,	127,033	126,078	124,939	130,399	118,651	133,064	132,080
September ,,	141,540	139,022	126,550	133,847	107,441	143,555	116,008
December ,,	132,453	132,696	138,525	134,649	124,771	149,048	128,982

Annual Rates of MARRIAGES, BIRTHS, *and* DEATHS, *per* 1,000 PERSONS LIVING *in the Years* **1898-92**, *and in the* QUARTERS *of those Years.*

Calendar YEARS, **1898-92** :—*General Ratios.*

YEARS............	'98.	Mean '88-'97.	'97.	'96.	'95.	'94.	'93.	'92.
Estmtd. Popln. of England and Wales *in thousands* in middle of each Year....	31,397,	—	31,055,	30,717,	30,383,	30,052,	29,725,	29,402,
Persons Married	—	15·3	16·0	15·8	15·0	15·1	14·7	15·4
Births	29·4	30·5	29·7	29·7	30·4	29·6	30·8	30·5
Deaths................	17·6	18·4	17·4	17·1	18·7	16·6	19·2	19·0

QUARTERS *of each Calendar Year,* **1898-92.**

(I.) PERSONS MARRIED :—*Ratio per* 1,000.

Qrs. ended last day of	'98.	Mean '88-'97.	'97.	'96.	'95.	'94.	'93.	'92.
March	11·6	11·8	11·7	11·3	10·6	12·9	11·0	11·7
June.....................	17·9	15·9	17·8	17·2	16·0	14·3	15·9	16·4
September	16·8	15·8	16·8	16·8	15·9	15·9	15·6	15·7
December	—	17·5	17·8	17·7	17·5	17·2	16·3	17·8

(II.) BIRTHS:—*Ratio per* 1,000.

Qrs. ended last day of	'98.	Mean '88-'97.	'97.	'96.	'95.	'94.	'93.	'92.
March	30·0	31·1	30·8	29·1	32·0	30·9	31·5	30·0
June.....................	29·7	31·1	29·2	30·2	30·8	29·5	31·7	31·7
September	29·7	30·2	29·8	29·5	30·3	28·5	30·7	30·9
December	28·3	29·5	28·9	30·1	28·3	29·6	29·2	29·3

(III.) DEATHS:—*Ratio per* 1,000.

Qrs. ended last day of	'98.	Mean '88-'97.	'97.	'96.	'95.	'94.	'93.	'92.
March	19·5	21·1	18·8	17·9	22·7	20·0	19·7	24·9
June.....................	16·2	17·9	16·3	16·3	17·2	15·8	18·0	18·0
September	17·9	16·6	17·8	16·3	17·5	14·2	19·2	15·7
December	16·7	18·2	17·0	17·9	17·6	16·5	19·9	17·4

B.—*Special Town Table:*—Population; Birth-Rate *and* Death-Rate *in each Quarter of* 1898, *in* Thirty-Three *Large Towns.*

Cities and Boroughs.	Estimated Population in the Middle of the Year 1898.	Annual Rate to 1,000 Living during the Thirteen Weeks ending						
		2nd April, 1898. (1st Quarter.)		2nd July, 1898. (2nd Quarter.)		1st Oct., 1898. (3rd Quarter.)		31st Dec., 1898. (4th Quarter.)	
		Births.	Deaths.	Births.	Deaths.	Births.	Deaths.	Births.	Deaths.
Thirty-three towns	11,218,378	31·3	20·6	30·0	17·1	30·4	20·3	29·7	18·1
London*	4,504,766	30·8	21·7	28·8	16·4	29·5	19·4	28·9	17·2
West Ham	286,654	32·4	16·3	29·0	12·1	30·1	17·5	31·0	15·7
Croydon	124,421	26·0	15·7	24·8	11·7	25·2	16·2	25·4	11·9
Brighton	122,310	24·9	19·8	25·2	12·7	25·1	18·0	24·1	17·1
Portsmouth	186,618	26·7	17·9	26·4	13·2	26·5	17·3	27·3	16·8
Plymouth	99,136	30·7	21·4	30·6	18·0	29·8	20·2	27·6	18·5
Bristol	316,900	29·4	21·1	28·2	15·1	28·7	16·6	28·3	16·1
Cardiff	177,570	32·0	17·5	31·4	12·6	31·2	15·9	29·9	13·4
Swansea	102,001	29·3	22·4	29·9	15·3	28·5	16·0	28·0	20·6
Wolverhampton	88,051	38·7	22·5	35·0	17·1	37·0	25·1	32·3	20·4
Birmingham	510,343	35·4	21·9	33·9	17·7	34·1	21·1	32·7	19·3
Norwich	111,699	31·6	20·4	29·9	15·7	28·1	20·4	29·9	19·4
Leicester	208,662	30·3	17·8	31·0	15·9	29·1	18·6	27·9	15·4
Nottingham	236,137	30·7	19·8	28·3	15·3	29·0	17·5	27·4	18·1
Derby	104,834	26·2	17·8	26·5	16·5	28·4	17·9	28·4	15·1
Birkenhead	113,189	30·6	17·2	28·3	15·2	31·1	20·5	31·6	16·9
Liverpool	633,645	36·5	23·5	34·7	23·0	34·3	26·3	35·2	23·1
Bolton	122,495	32·0	19·4	29·9	16·5	31·3	22·1	30·5	19·5
Manchester	539,079	33·3	21·2	33·8	20·0	32·0	24·1	31·8	22·3
Salford	215,702	35·4	20·5	35·3	19·6	34·4	28·7	33·9	22·0
Oldham	148,288	23·9	18·8	25·3	17·6	26·1	16·1	26·1	17·8
Burnley	109,546	29·1	17·1	27·4	14·7	26·0	17·3	26·0	16·1
Blackburn	133,228	27·2	18·3	28·7	16·3	26·9	19·4	25·4	19·7
Preston	116,356	33·2	18·3	27·9	16·0	33·9	22·3	29·1	20·8
Huddersfield	102,454	23·4	17·3	22·1	15·7	22·6	15·6	21·7	15·0
Halifax	96,729	24·9	20·0	21·3	18·8	22·9	16·6	22·5	16·1
Bradford	233,737	24·8	18·7	24·0	17·1	24·3	18·1	22·8	16·6
Leeds	416,618	30·5	19·3	31·8	18·9	31·5	20·6	31·1	18·0
Sheffield	356,678	33·8	19·8	32·9	18·0	34·2	23·8	34·6	19·4
Hull	229,887	34·3	18·9	34·2	15·6	33·9	21·7	31·4	17·3
Sunderland	143,849	33·9	19·8	37·4	22·2	35·5	27·5	34·8	21·0
Gateshead	103,775	36·8	19·9	35·6	20·1	36·6	23·3	33·2	19·2
Newcastle	223,021	32·6	18·5	32·3	22·6	32·3	23·9	29·4	20·8

* Including deaths of Londoners in the metropolitan workhouses, hospitals, and lunatic asylums situated outside Registration London, but excluding deaths of persons not belonging to London occurring in the London Fever Hospital, in the Metropolitan Asylum Board hospitals, and in the Middlesex County Lunatic Asylum, within Registration London. The deaths in the provincial towns have been similarly corrected.

C.—*Divisional Table:*—MARRIAGES *in the Year ending 30th September; and* BIRTHS *and* DEATHS *in the Year ending 31st December,* **1898,** *as Registered Quarterly.*

1	2	3	4	5	6	7	9	10	11	12	13	14	15	16
DIVISIONS. (England and Wales.)	AREA in Statute Acres.	Enumerated POPULATION, 1891.	MARRIAGES in Quarters ending				BIRTHS in each Quarter of **1898** ending				DEATHS in each Quarter of **1898** ending			
			31st December, 1897.	31st March, 1898.	30th June, 1898.	30th September, 1898.	31st March.	30th June.	30th September.	31st December.	31st March.	30th June.	30th September.	31st December.
		No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
ENGLD. & WALES....*Totals*	37,317,885	29,002,525	69,583	45,079	69,960	66,393	232,145	232,343	234,665	223,720	151,014	127,033	141,540	132,453
I. London	74,672	4,211,743	11,340	7,003	11,361	11,891	34,566	32,294	33,170	32,402	23,966	18,062	21,439	18,924
II. South-Eastern	3,993,270	2,867,078	6,566	3,857	6,298	5,848	19,833	19,515	20,191	19,299	13,722	10,417	12,194	11,479
III. South Midland........	3,246,576	1,863,883	4,198	2,173	3,971	4,069	13,934	13,971	14,232	13,322	8,856	6,822	8,147	7,400
IV. Eastern	3,126,946	1,575,311	4,068	1,964	3,271	3,125	12,764	12,610	12,846	12,489	8,095	6,267	7,510	7,017
V. South-Western........	5,026,461	1,908,998	3,856	2,644	3,903	3,415	12,488	12,556	13,011	11,815	10,017	7,254	7,010	7,208
VI. West Midland	4,048,533	3,252,105	8,442	4,890	8,177	7,377	27,179	27,442	27,380	26,103	17,425	14,341	15,634	14,811
VII. North Midland........	3,495,980	1,808,494	4,411	2,583	4,786	3,939	14,822	15,077	15,088	14,241	9,172	7,774	8,404	7,926
VIII. North-Western........	1,947,446	4,664,749	10,033	8,211	11,646	11,568	38,622	38,937	39,157	37,848	24,011	22,821	26,226	24,261
IX. Yorkshire	3,721,161	3,212,188	8,001	5,278	8,271	7,683	25,939	26,117	26,289	25,367	16,419	15,334	16,511	15,392
X. Northern	3,527,961	1,863,166	4,210	3,506	4,780	4,390	16,630	17,458	17,406	16,168	8,996	9,561	10,657	9,715
XI. Monmthsh. & Wales	5,108,879	1,774,810	4,458	2,970	3,496	3,088	15,368	16,366	15,895	14,666	10,335	8,380	7,808	8,320

D.—*General Meteorological Table,*

[Abstracted from the particulars supplied to the

1898. Months.	Temperature of										Elastic Force of Vapour.		Weight of Vapour in a Cubic Foot of Air.	
	Air.			Evaporation.		Dew Point.		Air—Daily Range.		Water of the Thames				
	Mean.	Diff. from Average of 127 Years.	Diff. from Average of 57 Years.	Mean.	Diff. from Average of 57 Years.	Mean.	Diff. from Average of 57 Years.	Mean.	Diff. from Average of 57 Years.		Mean.	Diff. from Average of 57 Years.	Mean.	Diff. from Average of 57 Years.
	°	°	°	°	°	°	°	°	°		In.	In.	Grs.	Gr.
Jan.......	43·6	+6·9	+5·4	41·7	+5·0	39·5	+4·9	7·8	−1·6	...	·242	+·043	2·8	+0·5
Feb.......	41·2	+2·4	+1·9	38·5	+0·9	35·1	+0·1	10·9	−0·2	...	·204	−·002	2·4	...
Mar. ...	39·8	−1·4	−1·9	37·3	−1·9	34·0	−1·9	12·8	−2·0	...	·198	−·016	2·3	−0·2
Means...	41·5	+2·6	+1·8	39·2	+1·3	36·2	+1·0	10·5	−1·3	...	·215	+·008	2·5	+0·1
April ...	48·0	+1·8	+1·0	44·0	+0·2	39·7	−0·6	17·6	−0·8	...	·244	−·006	2·8	−0·1
May......	51·7	−0·9	−1·0	48·0	−0·9	44·6	−0·3	15·3	−5·3	...	·295	−·002	3·4	...
June ...	57·6	−0·8	−1·5	53·6	−1·1	50·0	−0·8	17·5	−3·6	...	·361	−·011	4·0	...
Means...	52·4	...	−0·5	48·5	−0·6	44·8	−0·6	16·8	−3·2	...	·300	−·006	3·4	...
July......	61·5	−0·2	−0·7	56·6	−1·0	51·9	−2·0	19·6	−1·3	...	·386	−·029	4·3	−0·4
Aug. ...	64·6	+3·7	+3·2	59·3	+2·0	55·0	+1·1	20·7	+0·9	...	·433	+·017	4·8	+0·1
Sept. ...	62·1	+5·5	+5·0	55·9	+2·0	51·4	+0·3	23·2	+5·0	...	·379	+·001	4·2	−0·1
Means...	62·7	+3·0	+2·5	57·3	+1·0	52·8	−0·2	21·2	+1·5	...	·399	−·004	4·4	−0·1
Oct.......	53·8	+4·4	+4·2	51·1	+3·5	48·6	+3·1	11·2	−3·3	...	·343	+·038	3·9	+0·1
Nov. ...	45·9	+3·4	+2·3	44·4	+2·8	42·7	+3·0	10·5	−0·8	...	·274	+·027	3·1	+0·2
Dec. ...	45·8	+6·7	+6·1	43·5	+5·3	40·8	+4·5	9·2	−0·2	...	·255	+·039	2·9	+0·3
Means...	48·5	+4·8	+4·2	46·3	+3·9	44·0	+3·5	10·3	−1·4	...	·291	+·035	3·3	+0·2

Note. In reading this table it will be borne in mind that the sign (−) minus signifies

(Compiled from observations

for the Year ended 31st December, **1898.**

Registrar-General by JAMES GLAISHER, F.R.S., &c.]

Degree of Humidity.		Reading of Barometer.		Weight of a Cubic Foot of Air.		Rain.		Daily Horizontal Movement of the Air.	Reading of Thermometer on Grass.					1898. Months.
									Number of Nights it was			Lowest Reading at Night.	Highest Reading at Night.	
Mean.	Diff. from Average of 57 Years.	Mean.	Diff. from Average of 57 Years.	Mean.	Diff. from Average of 57 Years.	Amnt.	Diff. from Average of 83 Years.		At or below 30°.	Between 30° and 40°.	Above 40°.			
		In.	In.	Grs.	Grs.	In.	In.	Miles.				°	°	
85	− 2	30·151	+ ·384	555	+ 1	0·65	−1·20	244	7	17	7	27·5	44·2	January
79	− 5	29·771	− ·041	551	− 3	1·19	−0·35	380	15	10	3	22·4	42·1	Feb.
80	− 1	29·702	− ·042	551	+ 1	1·40	−0·16	340	18	12	1	22·2	44·9	March
81	− 3	29·875	+ ·100	552	0	Sum 3·24	Sum −1·71	Mean 321	Sum 40	Sum 39	Sum 11	Lowest 22·2	Highest 44·9	Means
73	− 6	29·743	− ·007	544	+ 1	0·93	−0·75	251	6	18	6	25·4	44·8	April
77	0	29·664	− ·127	537	− 3	2·64	+0·65	277	0	10	21	32·0	49·1	May
76	+ 2	29·814	·000	533	+ 1	1·75	−0·19	279	0	2	28	37·0	55·4	June
75	− 1	29·740	− ·045	538	0	Sum 5·32	Sum −0·29	Mean 279	Sum 6	Sum 30	Sum 55	Lowest 25·4	Highest 55·4	Means
72	− 3	29·935	+ ·144	531	+ 3	1·34	−1·21	238	0	1	30	39·1	58·0	July
71	− 6	29·845	+ ·065	526	− 4	0·86	−1·52	291	0	0	31	44·0	60·8	August
68	−13	29·930	+ ·123	530	− 3	0·31	−2·04	209	0	9	21	32·8	60·9	Sept.
70	− 7	29·903	+ ·111	529	− 1	Sum 2·51	Sum −4·77	Mean 246	Sum 0	Sum 10	Sum 82	Lowest 32·8	Highest 60·9	Means
83	− 6	29·669	− ·045	535	− 5	3·15	+0·37	255	0	7	24	34·9	50·2	October
89	− 2	29·678	− ·074	544	− 4	2·41	+0·09	238	10	16	4	18·1	45·6	Nov.
84	− 5	29·897	+ ·108	548	− 4	2·22	+0·24	381	8	12	11	18·6	49·9	Dec.
85	− 4	29·748	− ·004	542	− 4	Sum 7·78	Sum +0·70	Mean 291	Sum 18	Sum 35	Sum 39	Lowest 18·1	Highest 50·2	Means

below the average, and that the sign (+) plus signifies above the average.

made at Greenwich.)

E.—*Comparative Table of* CONSOLS, PROVISIONS, COAL, *and* PAUPERISM *in each* QUARTER *of* 1896-97-98.

Quarters ending	2¾ l. per Cent. CONSOLS (for Money) per 100l. Stock.*	DISCOUNT charged by the Bank of England.*	WHEAT per Quarter in England and Wales.†	MEAT per Pound at the Metropolitan Meat Market (by the Carcase).‡ Beef.			Mutton.			COAL (Seaborne) in the London Market per Ton.§		Quarterly Average of the Number of Paupers Relieved on the *Last Day* of each Week.	
	£ s. d.	£	s. d.	In-ferior Qual-ity.	Sec-ond Qual-ity.	First Qual-ity.	In-ferior Qual-ity.	Sec-ond Qual-ity.	First Qual-ity.	s.	d.	In-door.	Out-door.
1896				d.	d.	d.	d.	d.	d.				
Mar. 31	108 9 6	2·00	25 8	3½	5¾	6⅝	5	7¾	8½	14	6	212,102	535,813
June 30	112 1 6	2·00	25 2	3½	5½	6½	4⅞	7⅛	7⅞	13	6‖	193,072	517,456
Sept. 30	112 8 7	2·15	23 7	3½	5⅝	6½	4¾	7	8	13	1	188,862	508,700
Dec. 31	110 2 8	3·77	30 5	3½	5⅝	6¾	4¾	7¼	8½	16	2	205,270	513,660
1897													
Mar. 31	112 2 8	3·30	29 7	3⅝	5⅞	6¾	5⅝	7⅝	8⅝	16	9	212,680	530,841
June 30	112 14 8	2·27	27 6	3⅝	6	6⅞	5¾	7¾	8½	14	3‖	194,514	511,969
Sept. 30	112 5 10	2·29	30 4	3½	6	6⅞	5¾	7½	8½	15	—	190,185	507,087
Dec. 31	112 8 8	2·93	33 3	3½	5¾	6⅝	5	7⅝	8¾	16	2	205,999	510,318
1898													
Mar. 31	112 6 6	3·00	35 1	3½	5⅝	6½	5	7⅝	8⅝	16	—	214,014	522,433
June 30	110 19 11	3·57	41 5	3½	5¾	6¼	4¼	6⅝	7¾	15	9‖	199,901	525,352
Sept. 30	110 14 8	2·55	32 8	3½	5½	6⅜	4⅝	7	8½	16	6‖	194,328	531,036
Dec. 31	109 16 11	3·86	27 2	3⅝	5⅝	6⅝	4⅞	7¼	8⅝	16	6‖	207,523	497,638

* Furnished by the Chief Cashier of the Bank of England.
† As published by the Board of Agriculture.
‡ Furnished by the Board of Agriculture.
§ The prices of coal are furnished by the Mineral Statistics Department of the Home Office.
‖ Sunderland coal only.

F.—*Special Average Death-Rate Table:*—ANNUAL RATE *of* MORTALITY *per* 1,000 *in* TOWN *and* COUNTRY DISTRICTS *of* ENGLAND *in each Quarter of the Years* 1896-98.

	Area in Statute Acres.	Population Estimated in the middle of 1898.	Quarters ending	Annual Rate of Mortality per 1,000 in each Quarter of the Years 1898.	Mean '88-97.	1897.	1896.
TOWN DISTRICTS. The 100 Towns, together with all Registration Sub-Districts three-fourths of the population of which, as enumerated in 1891, resided within the boundaries of Urban Sanitary Districts*	4,222,051	21,454,691	March..	19·8	21·6	18·9	18·5
			June	16·6	18·5	16·6	17·2
			Sept.	19·3	17·8	19·4	17·6
			Dec.	17·5	19·3	17·9	18·6
			Year	18·3	19·3	18·2	18·0
			Year	16·0	16·8	15·8	15·3
COUNTRY DISTRICTS. All the remaining Regis-tration Sub-Districts of England and Wales— not coming within the above definition of Town Districts	33,095,834	9,942,387	March..	18·9	20·2	18·4	16·6
			June	15·4	16·7	15·6	14·5
			Sept.	14·9	14·2	14·3	13·7
			Dec.	15·0	16·3	14·9	16·3

* For the years prior to 1894 the figures relate to the 33 great Towns; 67 other large Town districts (represented approximately by Registration Districts or Sub-Districts); and all other Registration Sub-Districts, three-fourths of the population of which, as enumerated in 1881, resided within the boundaries of Urban Districts existing in 1886.

No. II.—SCOTLAND.

BIRTHS, DEATHS, AND MARRIAGES, IN THE YEAR ENDED 31ST DECEMBER, 1898.

I.—*Serial Table :—Number of* BIRTHS, DEATHS, *and* MARRIAGES *in Scotland, and their Proportion to the Population estimated to the Middle of each Year, during each Quarter of the Years* **1898-94** *inclusive.*

	1898.		1897.		1896.		1895.		1894.	
	Number.	Per Cent.	Number.	Per Cent.	Number.	Per Cent.	Number.	Per Cent.	Number.	Per Cent.
1st Quarter—										
Births	31,641	3·02	31,720	3·05	31,033	2·98	31,781	3·10	30,776	3·03
Deaths........	20,341	1·94	21,996	2·11	18,510	1·78	26,119	2·55	20,181	1·98
Marriages ..	7,293	0·70	7,457	0·72	7,046	0·68	6,073	0·59	6,391	0·63
Mean Temperature	40°·2		38°·0		40°·8		33°·1		39°·2	
2nd Quarter—										
Births	34,444	3·25	33,645	3·20	33,745	3·24	33,355	3·22	31,685	3·08
Deaths........	20,493	1·92	20,127	1·91	17,613	1·69	19,991	1·93	17,510	1·70
Marriages ..	8,162	0·77	8,033	0·76	8,004	0·77	7,413	0·72	7,139	0·69
Mean Temperature	49°·2		47°·8		52°·1		50°·6		48°·6	
3rd Quarter—										
Births	32,810	3·06	32,127	3·02	32,052	3·05	31,840	3·04	30,015	2·89
Deaths........	18,553	1·73	18,039	1·70	16,062	1·53	17,498	1·67	15,001	1·44
Marriages ..	7,906	0·74	7,559	0·71	7,493	0·71	7,191	0·69	6,480	0·62
Mean Temperature	56°·6		56°·0		54°·7		56°·8		54°·9	
4th Quarter—										
Births	31,985	2·99	31,331	2·95	32,323	3·07	29,478	2·81	31,861	3·06
Deaths........	19,020	1·78	18,899	1·78	18,449	1·75	18,256	1·74	18,420	1·77
Marriages ..	8,735	0·82	7,917	0·74	7,713	0·73	7,703	0·74	7,551	0·73
Mean Temperature	44°·8		43°·7		40°·4		40°·7		43°·0	
Year—										
Population .	4,249,946		4,218,279		4,186,849		4,155,654		4,124,691	
Births	130,880	3·08	128,823	3·05	129,153	3·08	126,454	3·04	124,337	3·01
Deaths........	78,407	1·84	79,061	1·87	70,634	1·69	81,864	1·97	71,112	1·72
Marriages ..	32,096	0·76	30,966	0·73	30,256	0·72	28,380	0·68	27,561	0·67

II.—*Special Average Table:—Number of Births, Deaths, and Marriages in Scotland and in the Town and Country Districts for each Quarter of the Year ending 31st December,* **1898,** *and their Proportion to the Population; also the Number of Illegitimate Births, and their Proportion to the Total Births.*

Registration Groups of Districts.	Total Births.		Illegitimate Births.		Deaths.		Marriages.	
	Number.	Annual Rate per Cent.	Number.	Per Cent. of Total Births.	Number.	Annual Rate per Cent.	Number.	Annual Rate per Cent.
1st Quarter—								
SCOTLAND	31,641	3·02	2,189	6·9	20,341	1·94	7,293	0·70
Principal towns	13,676	3·17	879	6·4	9,055	2·10	3,615	0·84
Large ,, ...	4,551	3·25	268	5·9	2,811	2·01	1,045	0·75
Small ,, ...	6,678	3·02	457	6·8	4,061	1·84	1,420	0·64
Mainland rural	6,101	2·71	561	9·2	3,931	1·74	1,068	0·47
Insular ,, ...	635	2·12	24	3·8	483	1·61	145	0·48
2nd Quarter—								
SCOTLAND	34,444	3·25	2,231	6·5	20,493	1·92	8,162	0·77
Principal towns	14,941	3·42	927	6·2	9,245	2·12	4,278	0·98
Large ,, ...	4,956	3·50	234	4·7	2,803	1·98	1,013	0·72
Small ,, ...	7,324	3·28	504	6·9	3,958	1·77	1,484	0·66
Mainland rural	6,614	2·90	530	8·0	4,017	1·76	1,313	0·58
Insular ,, ...	609	2·01	36	5·9	470	1·55	74	0·24
3rd Quarter—								
SCOTLAND	32,810	3·06	2,280	6·9	18,553	1·73	7,906	0·74
Principal towns	14,128	3·20	927	6·6	8,558	1·94	4,328	0·98
Large ,, ...	4,543	3·17	263	5·8	2,537	1·77	1,095	0·77
Small ,, ...	7,162	3·17	488	6·8	3,764	1·67	1,488	0·66
Mainland rural	6,220	2·70	567	9·1	3,280	1·42	942	0·41
Insular ,, ...	757	2·47	35	4·6	414	1·35	53	0·17
4th Quarter—								
SCOTLAND	31,985	2·99	2,214	6·9	19,020	1·78	8,735	0·82
Principal towns	13,769	3·12	939	6·8	8,515	1·93	4,030	0·91
Large ,, ...	4,402	3·08	225	5·1	2,584	1·81	1,102	0·77
Small ,, ...	6,972	3·09	437	6·3	3,835	1·70	1,859	0·82
Mainland rural	6,089	2·64	569	9·3	3,617	1·57	1,601	0·69
Insular ,, ...	753	2·45	44	5·8	469	1·53	143	0·47

Population of Scotland.

Population.	Scotland.	Principal Towns.	Large Towns.	Small Towns.	Mainland Rural.	Insular Rural.
By Census of 1891............	4,025,647	1,583,566	515,762	852,401	947,966	125,952
Estimated to the middle of 1898	4,249,946	1,750,580	567,771	895,751	914,112	121,732

III.—*Divisional Table:*—Marriages, Births, *and* Deaths *Registered in the Year ended* 31*st December,* **1898.**

(Compiled from the Registrar-General's Quarterly Returns.)

1	2	3	4	5	6
DIVISIONS. (Scotland.)	Area in Statute Acres.	Population, 1891. (*Persons.*)	Marriages.	Births.	Deaths.
		No.	No.	No.	No.
Scotland .... *Totals*	19,639,377	4,025,647	32,096	130,880	78,407
I. Northern	2,261,622	118,237	500	2,436	1,743
II. North-Western........	4,739,876	164,262	810	3,926	2,594
III. North-Eastern	2,429,594	433,199	3,208	13,519	7,406
IV. East Midland	2,790,492	630,098	4,516	18,053	11,953
V. West Midland	2,693,176	313,749	2,040	10,082	5,888
VI. South-Western........	1,462,397	1,563,097	14,572	59,574	34,070
VII. South-Eastern	1,192,524	599,213	5,245	18,473	11,407
VIII. Southern	2,069,696	203,792	1,205	4,817	3,346

No. III.—GREAT BRITAIN AND IRELAND.

Summary *of* Marriages, *in the Year ended* 30*th September,* **1898**; *and of* Births *and* Deaths, *in the Year ended* 31*st December,* **1898.**

(Compiled from the Quarterly Returns of the respective Registrars-General.)

COUNTRIES.	[000's omitted.]		Marriages.	Per 1,000 of Population.	Births.	Per 1,000 of Population.	Deaths.	Per 1,000 of Population.
	Area in Statute Acres.	Population, 1891. (*Persons.*)						
	No.	No.	No.	Ratio.	No.	Ratio.	No.	Ratio.
England and Wales	37,318,	29,003,	251,015	8·7	922,873	31·8	552,040	19·0
Scotland	19,639,	4,026,	31,278	7·8	130,880	32·4	78,407	19·4
Ireland	20,323,	4,705,	22,576	4·8	105,440	22·4	82,450	17·5
Great Britain and Ireland	77,280,	37,734,	304,869	8·1	1,159,193	30·7	712,897	18·9

Trade of United Kingdom, 1898-97-96.—*Distribution of* **Exports*** *from United Kingdom, according to their Declared Real Value; and the Declared Real Value (Ex-duty) of* **Imports** *at Port of Entry, and therefore including Freight and Importer's Profit.*

Merchandise (*excluding Gold and Silver*) Imported from, and Exported to, the following Foreign Countries, &c.	[000's omitted.]					
	1898.		1897.		1896.	
	Imports from	Exports to	Imports from	Exports to	Imports from	Exports to
	£	£	£	£	£	£
I.—FOREIGN COUNTRIES.						
Northern Europe; viz., Russia, Sweden, Norway, Denmark and Iceland	45,897,	18,979,	48,087,	16,415,	47,154,	15,245,
Central Europe; viz., Germany, Holland, and Belgium	78,658,	39,968,	76,047,	38,689,	76,068,	38,395,
Western Europe; viz., France, Portugal (with Azores, Madeira, &c.), and Spain (with Gibraltar and Canaries)	69,043,	19,455,	69,910,	19,808,	65,402,	20,197,
Southern Europe; viz., Italy, Austrian Empire, Greece, Roumania, Bulgaria, & Malta	8,693,	10,893,	8,963,	10,474,	9,314,	9,985,
Levant; viz., Turkey, Asiatic and European (including Cyprus), and Egypt	13,935,	10,595,	15,548,	10,973,	14,976,	8,812,
Northern Africa; viz., Tripoli, Tunis, Algeria and Morocco	1,459,	1,129,	1,210,	965,	1,150,	1,075,
Western Africa	622,	1,245,	553,	1,002,	334,	970,
Eastern Africa; with African Ports on Red Sea, Aden, Arabia, Persia, Bourbon, and Kooria Mooria Islands	684,	2,114,	750,	2,403,	701,	1,954,
Indian Seas, Siam, Sumatra, Java, Philippines; other Islands	2,036,	2,657,	2,219,	2,704,	2,434,	2,870,
South Sea Islands	147,	198,	189,	186,	195,	123,
China and Japan, including Hong Kong	4,551,	12,185,	4,589,	12,925,	5,030,	14,574,
United States of America	126,048,	14,722,	113,042,	20,995,	106,347,	20,424,
Mexico and Central America	1,458,	2,298,	1,608,	2,448,	1,542,	2,787,
Foreign West Indies, Hayti, &c.	199,	689,	195,	1,148,	183,	1,336,
South America (Northern), Colombia, Venezuela, and Ecuador	934,	1,582,	712,	2,174,	780,	2,507,
„ (Pacific), Peru, Bolivia, Chili, and Patagonia	5,160,	2,504,	4,645,	2,955,	4,895,	3,455,
„ (Atlantic) Brazil, Uruguay, and Argentine Republic	12,781,	13,048,	9,830,	11,043,	13,344,	14,734,
Whale Fisheries; Grnlnd., Davis' Straits, Southn. Whale Fishery, Falkland Islands, and French Possessions in North America	198,	36,	157,	51,	163,	40,
Total—Foreign Countries	372,503,	154,297,	358,254,	157,358,	350,012,	159,483,
II.—BRITISH POSSESSIONS.						
British India, Ceylon, and Singapore	36,307,	33,656,	33,144,	30,940,	34,319,	33,135,
Austral. Cols.—N. So.W., Victoria & Queensld.	17,259,	13,227,	18,173,	12,754,	18,266,	13,199,
„ „ So. Aus., W. Aus., Tasm., N. Zealand, & Fiji Islands	11,587,	7,908,	11,189,	8,556,	11,137,	8,716,
British North America	20,752,	6,131,	19,539,	5,476,	16,444,	5,756,
„ W. Indies with Btsh. Guiana & Honduras	2,106,	2,640,	2,206,	2,588,	2,749,	2,886,
Cape and Natal	6,006,	12,196,	4,948,	13,384,	5,254,	13,821,
Brt. W. Co. of Af., Ascension and St. Helena	2,353,	2,026,	2,154,	1,787,	2,224,	1,846,
Mauritius	101,	239,	95,	285,	68,	306,
Channel Islands	1,544,	1,071,	1,327,	1,092,	1,336,	998,
Total—British Possessions	98,015,	79,094,	92,775,	76,862,	91,797,	80,663,
General Total £	470,519,	233,391,	451,029,	234,220,	441,809,	240,146,

* *i.e.*, British and Irish produce and manufactures.

Trade of United Kingdom, for the Years 1897-93.—*Declared Value of the Total Exports of* **Foreign** *and* **Colonial** *Produce and Manufactures to each Foreign Country and British Possession.*

Merchandise Exported to the following Foreign Countries, &c.	[000's omitted.]				
	1897.	1896.	1895.	1894.	1893.
I.—FOREIGN COUNTRIES.	£	£	£	£	£
Northern Europe; viz., Russia, Sweden, Norway, Denmark, and Iceland	6,477,	6,473,	5,770,	6,771,	6,093,
Central Europe; viz., Germany, Holland, and Belgium	19,572,	20,247,	20,664,	21,923,	22,641,
Western Europe; viz., France, Portugal (with Azores, Madeira, &c.), and Spain (with Gibraltar and Canaries)	6,805,	7,632,	7,398,	7,189,	7,582,
Southern Europe; viz., Italy, Austrian Empire, Greece, Ionian Islands, and Malta	1,485,	1,159,	1,259,	1,305,	1,367,
Levant; viz., Turkey, Roumania, Syria and Palestine, and Egypt	638,	432,	404,	554,	558,
Northern Africa; viz., Tripoli, Tunis, Algeria, and Morocco	119,	123,	151,	109,	126,
Western Africa	70,	72,	74,	84,	89,
Eastern Africa; with African Ports on Red Sea, Aden, Arabia, Persia, Bourbon, and Kooria Mooria Islands	23,	20,	13,	20,	17,
Indian Seas, Siam, Sumatra, Java, Philippines; other Islands	45,	48,	55,	62,	91,
South Sea Islands	—	—	—	—	—
China, including Hong Kong and Japan ...	313,	407,	392,	517,	446,
United States of America	16,939,	11,612,	16,120,	11,976,	11,758,
Mexico and Central America	166,	220,	197,	140,	136,
Foreign West Indies and Hayti	520,	523,	758,	884,	983,
South America (Northern), Colombia, Venezuela, and Ecuador	51,	72,	60,	67,	77,
„ (Pacific), Peru, Bolivia, Chili, and Patagonia	256,	254,	290,	238,	290,
„ (Atlantic), Brazil, Uruguay, and Argentine Confed.	503,	594,	489,	458,	453,
Other countries (unenumerated)	171,	150,	107,	87,	80,
Total—Foreign Countries...............	53,953,	50,038,	54,201,	52,384,	52,787,
II.—BRITISH POSSESSIONS.					
British India, Ceylon, and Singapore	709,	844,	881,	927,	1,295,
Austral. Cols.—New South Wales and Victoria, So. Aus., W. Aus., Tasm., and N. Zealand	2,385,	2,439,	2,034,	1,943,	1,897,
British North America	989,	940,	1,056,	1,070,	1,361,
„ W.Indies with Btsh.Guiana & Honduras	410,	427,	412,	475,	447,
Cape and Natal	1,004,	1,064,	882,	663,	771,
Brt. W. Co. of Af., Ascension and St. Helena....	236,	225,	203,	232,	213,
Mauritius	18,	21,	26,	26,	36,
Channel Islands	211,	204,	211,	209,	203,
Other possessions	39,	32,	36,	33,	33,
Total—British Possessions	6,001,	6,196,	5,741,	5,578,	6,256,
General Total ....£	59,954,	56,234,	59,942,	57,962,	59,043,

IMPORTS.—(United Kingdom.)—**For the Years 1898-97-96-95-94.**—*Declared Real Value (Ex-duty), at Port of Entry (and therefore including Freight and Importer's Profit), of Articles of Foreign and Colonial Merchandise Imported into the United Kingdom.*

[000's omitted.]

FOREIGN ARTICLES IMPORTED.		1898.	1897.	1896.	1895.	1894.
		£	£	£	£	£
RAW MATLS.—*Textile,&c.*	Cotton, Raw ...	34,126,	32,195,	36,272,	30,429,	32,944,
	Wool	25,638,	26,752,	26,903,	28,427,	26,512,
	Silk*..................	18,820,	18,787,	18,739,	17,121,	14,606,
	Flax	2,933,	3,203,	3,117,	3,271,	2,525,
	Hemp and Jute	6,110,	5,706,	6,119,	6,446,	6,520,
	Indigo	891,	1,471,	1,534,	1,393,	1,149,
		88,518,	88,114,	92,684,	87,087,	84,256,
,, ,, *Various.*	Hides	2,906,	2.750,	2,225,	2,804,	2,231,
	Oils	2,278,	2,063,	2,432,	2,572,	2,906,
	Metals	19,561,	19,251,	18,266,	16,549,	17,083,
	Tallow	2,066,	1,870,	2,179,	2,575,	2,345,
	Timber...............	21,286,	23,648,	19,404,	15,743,	17,151,
		48,097,	49,582,	44,506,	40,243,	41,716,
,, ,, *Agrcltl.*	Guano	118,	90,	104,	392,	146,
	Seeds	6,012,	5,751,	6,736,	6,279,	7,138,
		6,130,	5,841,	6,840,	6,671,	7,284,
TROPICAL, &c., PRODUCE.	Tea	10,368,	10,405,	10,563,	10,243,	9,765,
	Coffee and Chic...	3,787,	3,629,	3,609,	3,835,	3,588,
	Sugar & Molasses	17,557,	16,197,	18,539,	17,897,	19,399,
	Tobacco	3,877,	4,066,	4,352,	3,354,	3,472,
	Rice	2,006,	2,116,	1,688,	1,982,	1,979,
	Fruits	8,961,	9,122,	7,156,	6,527,	7,266,
	Wines	6,579,	6,434,	5,946,	5,448,	5,018,
	Spirits	1,814,	2,018,	1,889,	1,823,	2,133,
		54,949,	53,987,	53,742,	51,109,	52,620,
FOOD	Grain and Meal.	62,899,	53,580,	52,800,	49,723,	48,220,
	Provisions	64,200,	61,428,	57,162,	55,164,	53,893,
		127,099,	115,008,	109,962,	104,887,	102,113,
Remainder of Enumerated Articles		96,106,	91,455,	83,640,	78,930,	73,600,
TOTAL ENUMERATED IMPORTS		420,899,	403,987,	391,374,	368,927,	361,589,
Add for UNENUMERATED IMPORTS (say)		49,705,	47,042,	50,435,	47,763,	46,755,
TOTAL IMPORTS		470,604,	451,029,	441,809,	416,690,	408,344,

* " Silk," inclusive of manufactured silk, " not made up."

EXPORTS.—(United Kingdom.)—**For the Years 1898-97-96-95-94.**—*Declared Real Value, at Port of Shipment, of Articles of* BRITISH *and* IRISH *Produce and Manufactures Exported from the United Kingdom.*

[000's omitted.]

BRITISH PRODUCE, &c., EXPORTED.		1898.	1897.	1896.	1895.	1894.
		£	£	£	£	£
MANFRS.—*Textile.*	Cotton Manufactures..	55.987,	54,044,	59,310,	54,455,	57,279,
	„ Yarn	8,921,	9,930,	10,045,	9,291,	9,286,
	Woollen Manufactures	13,702,	15,976,	18,269,	19,738,	14,011,
	„ Yarn	6,440,	6,595,	7,223,	7,259,	5,972,
	Silk Manufactures........	1,531,	1,338,	1,423,	1,435,	1,222,
	„ Yarn	334,	256,	265,	296,	342,
	Linen Manufactures	4,388,	4,771,	5,031,	5,351,	4,505,
	„ Yarn	886,	976,	1,041,	966,	939,
		92,189,	93,886,	102,607,	98,791,	93,556,
„ *Sewed.*	Apparel	4,695,	4,980,	5,229,	4,525,	4,123,
	Haberdy. and Mllnry.	1,503,	1,485,	1,518,	1,353,	1,247,
		6,198,	6,465,	6,747,	5,878,	5,370,
METALS, &c.	Hardware	1,989,	2,104,	2,122,	1,856,	1,835,
	Machinery....................	18,380,	16,256,	17,014,	15,151,	14,205,
	Iron	22,640,	24,641,	23,802,	19,681,	18,689,
	Copper and Brass........	3,268,	3,019,	3,037,	3,238,	2,772,
	Lead and Tin	940,	862,	921,	877,	950,
	Coals and Culm	18,135,	16,655,	15,156,	15,434,	17,371,
		65,352,	63,537,	62,052,	56,237,	55,822,
Ceramic Manufcts.	Earthenware and Glass	2,701,	2,771,	2,860,	2,782,	2,474,
Indigenous Mnfrs.	Beer and Ale................	1,624,	1,621,	1,592,	1,524,	1,463,
and Products.	Butter	61,	71,	78,	102,	98,
	Cheese	37,	38,	37,	38,	40,
	Candles	329,	333,	357,	386,	331,
	Salt.............................	460,	466,	470,	546,	504,
	Spirits	1,956,	1,844,	1,798,	1,560,	1,378,
		4,467,	4,373,	4,332,	4,156,	3,914,
Various Manufcts.	Books, Printed	1,339,	1,331,	1,309,	1,228,	1,218,
	Furniture	613,	629,	596,	517,	419,
	Leather Manufactures	3,326,	3,381,	3,474,	3,359,	3,124,
	Soap	831,	762,	746,	757,	621,
	Plate and Watches	429,	418,	388,	346,	301,
	Stationery	988,	948,	959,	860,	797,
		7,526,	7,469,	7,472,	7,067,	6,480,
Remainder of Enumerated Articles		38,177,	39,708,	38,312,	36,573,	34,733,
Unenumerated Articles.............................		16,781,	16,011,	15,764,	14,406,	13,475,
TOTAL EXPORTS....................		233,391,	234,220,	240,146,	225,890,	215,824,

SHIPPING.—(United Kingdom.)—*Account of Tonnage of Vessels Entered and Cleared with Cargoes, from and to Various Countries, during the* **Years** *ended Dec.,* **1898-97-96.**

Countries from whence Entered and to which Cleared.	Total British and Foreign.					
	1898.		1897.		1896.	
	Entered.	Cleared.	Entered.	Cleared.	Entered.	Cleared.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
FOREIGN COUNTRIES.						
Russia { Northern ports	1,680,159	1,681,719	1,778,863	1,519,785	1,808,101	1,422,206
Southern ,, ...	628,037	273,005	629,941	195,936	844,667	167,435
Sweden	1,734,840	1,667,346	1,776,449	1,606,891	1,771,171	1,468,781
Norway	1,341,370	1,080,225	1,400,877	1,060,627	1,294,848	1,016,192
Denmark	389,149	1,419,374	400,988	1,400,219	391,346	1,280,620
Germany	2,194,774	4,206,576	2,160,116	4,212,299	2,043,491	3,973,108
Holland	2,292,286	2,208,890	2,393,049	2,290,845	2,377,889	2,184,900
Belgium	1,868,499	1,976,253	1,838,348	1,864,973	1,780,683	1,765,574
France	2,647,876	4,498,954	2,745,226	4,480,550	2,522,416	4,194,015
Spain	3,154,223	1,252,380	3,395,975	1,502,275	3,224,741	1,461,755
Portugal	141,103	460,657	142,147	455,933	130,110	432,075
Italy	224,975	2,617,478	231,239	2,707,500	233,323	2,440,117
Austrian territories	90,713	255,907	101,346	248,776	81,963	197,231
Greece	195,286	183,572	213,718	193,308	198,912	180,799
Turkey	248,656	365,918	314,016	478,011	335,234	444,945
Roumania	261,808	203,619	235,383	233,858	282,587	216,962
Egypt	410,705	1,104,743	402,141	1,083,351	389,174	1,048,064
Algeria	240,560	250,646	223,508	254,585	169,177	220,120
United States of America	7,203,874	4,383,256	7,157,664	4,164,031	6,431,303	4,042,091
Mexico, Foreign W. Indies, and Central America	115,867	282,214	86,290	423,668	88,659	388,056
Republic of Colombia	112,662	225,858	90,682	160,832	109,272	191,085
Brazil	134,323	809,214	223,461	958,845	190,140	1,017,410
Peru	75,370	79,007	68,366	52,238	51,536	63,716
Chili	214,179	330,313	211,118	320,202	256,807	341,781
Uruguay	6,421	199,698	14,518	214,160	15,909	198,051
Argentine Republic	1,050.843	855,466	780,103	643,391	1,179,492	788,840
China	11,797	70,041	75,751	74,981	87,799	81,077
Java	43,829	182,582	33,629	195,940	49,263	184,775
Other countries	605,689	1,147,873	383,926	753,864	337,452	699,377
Total, Foreign Countries	29,319,873	34,272,784	29,508,838	33,751,874	28,677,465	32,111,158
BRITISH POSSESSIONS.						
North American Colonies	2,053,925	1,035,430	2,054,828	873,210	1,696,142	850,821
E. Indies, including Ceylon, Singapore, and Mauritius	1,307,060	1,412,430	1,119,291	1,502,591	1,248,637	1,707,499
Australia and New Zealand	775,607	871,041	816,373	875,480	818,564	843,525
West Indies	61,191	126,649	72,498	227,234	104,457	231,254
Channel Islands	437,419	374,129	423,083	364,435	402,101	329,597
Gibraltar and Malta	6,949	458,474	9,809	465,473	3,865	370,733
Cape of G. Hope and Natal	353,172	496,322	415,485	868,415	341,265	875,959
Other possessions	200,608	415,383	215,946	379,564	187,096	382,749
Total, British Possessions	5,195,931	5,189,858	5,127,313	5,556,402	4,802,127	5,592,137
TOTAL FOREIGN COUNTRIES AND BRITISH POSSESSIONS.						
Twelve Months { 1898........	34,515,804	39,462,642	—	—	—	—
ended { '97........	—	—	34,636,151	39,308,276	--	—
December, { '96........	—	—	—	—	33,479,592	37,703,295

GOLD AND SILVER BULLION AND SPECIE. — (United Kingdom.)
—*Declared Real Value of*, IMPORTED AND EXPORTED *for the* Years 1898-97-96.

[000's omitted.]

Countries.	1898.		1897.		1896.	
	Gold.	*Silver.*	Gold.	*Silver.*	Gold.	*Silver.*
Imported from—	£	£	£	£	£	£
Australasia	7,566,	85,	10,604,	59,	4,606,	158,
S. America, Brazil, Mexico, W. Indies	2,093,	1,682,	1,929,	1,849,	2,703,	1,702,
United States	49,	9,359,	68,	10,088,	3,171,	10,141,
	9,708,	11,126,	12,601,	11,996,	10,480,	12,001,
France	4,431,	1,227,	622,	3,018,	756,	1,741,
Germany, Holland, Belg., and Sweden	5,851,	2,116,	683,	2,803,	1,605,	260,
Portugal, Spain, and Gibraltar	420,	25,	544,	34,	859,	32,
Malta and Egypt	825,	76,	310,	69,	255,	128,
China, with Hong Kong and Japan	3,786,	23,	743,	13,	1,027,	72,
West Coast of Africa	89,	9,	148,	26,	205,	57,
British Possessions in South Africa	16,769,	34,	13,621,	33,	8,003,	13,
All other Countries	1,842,	42,	1,537,	40,	1,279,	25,
Totals Imported	43,721,	14,678,	30,809,	18,032,	24,469,	14,329,
Exported to—						
France	1,444,	3,672,	1,139,	964,	2,425,	2,915,
Germany, Holland, Belg., and Sweden	13,893,	1,906,	13,494,	2,442,	6,286,	647,
Russia	55,	2,093,	279,	6,639,	626,	3,553,
Portugal, Spain, and Gibraltar	41,	1,182,	9,	903,	93,	335,
	15,433,	8,853,	14,921,	10,948,	9,430,	7,450,
B. India, China, Hong Kong, and Japan	6,427,	5,949,	7,787,	7,223,	2,952,	6,897,
United States	10,942,	8,	1,208,	16,	10,528,	7,
South Africa	—	98,	—	61,	820,	166,
S. America, Brazil, Mexico, W. Indies	2,611,	22,	679,	21,	2,105,	92,
All other Countries	1,177,	694,	6,214,	522,	4,289,	436,
Totals Exported	36,590,	15,624,	30,809,	18,781,	30,124,	15,048,
Excess of imports	7,131,	—	—	—	—	—
,, exports	—	946,	—	749,	5,655,	719,

BRITISH CORN.—*Gazette Average Prices* (ENGLAND AND WALES), Weekly for **1898.**

Weeks ended on Saturday.	Weekly Average. (Per Imperial Quarter.)			Weeks ended on Saturday.	Weekly Average. (Per Imperial Quarter.)		
	Wheat.	Barley.	Oats.		Wheat.	Barley.	Oats.
1898.	s. d.	s. d.	s. d.	1898.	s. d.	s. d.	s. d.
Jan. 1	34 6	27 3	17 1	July 2	38 3	23 4	20 8
„ 8	34 11	27 9	16 10	„ 9	36 10	25 –	20 5
„ 15	35 –	27 8	17 4	„ 16	37 1	24 1	20 10
„ 22	34 11	27 10	17 5	„ 23	38 1	25 –	20 10
„ 29	34 6	27 8	17 2	„ 30	36 11	24 2	20 11
Feb. 5	34 10	28 –	17 6	Aug. 6	35 7	26 11	20 7
„ 12	35 1	27 8	17 5	„ 13	33 8	27 5	20 9
„ 19	35 –	27 11	17 8	„ 20	32 7	24 4	19 11
„ 26	35 5	27 6	17 10	„ 27	30 7	27 6	19 3
March 5	35 10	28 –	17 11	Sept. 3	28 1	27 8	18 11
„ 12	35 8	27 10	17 9	„ 10	26 10	27 9	17 10
„ 19	35 6	28 –	17 10	„ 17	25 7	26 10	16 10
„ 26	35 4	28 6	17 8	„ 24	25 5	26 9	17 1
April 2	35 3	27 11	17 10	Oct. 1	25 9	27 –	16 7
„ 9	35 2	27 –	17 11	„ 8	26 6	27 5	16 7
„ 16	35 3	28 –	18 2	„ 15	26 6	27 11	16 6
„ 23	36 1	28 3	18 4	„ 22	26 8	28 1	16 6
„ 30	38 4	27 10	18 11	„ 29	27 4	28 8	16 8
May 7	42 4	27 8	20 4	Nov. 5	28 4	28 6	17 2
„ 14	45 11	27 1	21 1	„ 12	28 4	28 7	17 5
„ 21	48 1	26 –	21 3	„ 19	28 1	28 5	17 2
„ 28	47 9	26 5	21 5	„ 26	27 9	28 4	17 1
June 4	46 3	26 10	21 –	Dec. 3	27 7	28 6	17 1
„ 11	45 4	25 8	20 11	„ 10	27 6	28 6	17 3
„ 18	42 4	26 1	20 5	„ 17	27 2	28 5	17 –
„ 25	40 8	24 3	20 7	„ 24	26 9	28 6	17 –
				„ 31	26 11	28 4	17 –

BRITISH CORN.—*Gazette Average Prices* (ENGLAND AND WALES), *Summary of, for* **1898**, *with those for* **1897** *added for comparison.*

Average for	Per Imperial Quarter, 1898.						Per Imperial Quarter, 1897.					
	Wheat.		Barley.		Oats.		Wheat.		Barley.		Oats.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
January	34	9	27	7	17	2	31	2	24	11	16	4
February	35	1	27	9	17	7	29	4	24	2	16	5
March	35	7	28	1	17	9	27	11	22	9	16	2
First quarter	35	1	27	10	17	6	29	6	23	11	16	4
April	36	—	27	9	18	2	27	3	22	1	16	4
May	46	—	26	9	21	—	28	—	20	7	17	5
June	43	7	25	8	20	8	27	3	21	8	18	—
Second quarter	41	10	26	9	19	11	27	6	21	3	17	3
July	37	5	24	3	20	8	27	9	18	—	18	8
August	33	1	26	6	20	1	30	3	19	7	17	7
September	26	5	27	3	17	8	33	7	27	11	16	11
Third quarter	32	4	26	—	19	6	30	6	21	10	17	9
October	26	6	27	9	16	6	32	5	28	4	16	1
November	28	1	28	5	17	2	33	9	26	3	16	5
December	27	2	28	5	17	—	33	11	26	3	16	9
Fourth quarter	27	3	28	2	16	11	33	4	26	11	16	5
THE YEAR	34	2	27	2	18	4	30	3	23	6	16	11

BANK OF ENGLAND.

Pursuant to the Act 7th and 8th Victoria, cap. 32 (1844)

[0,000's omitted.]

1	2	3	4	5	6	7
		ISSUE DEPARTMENT.			COLLATERAL COLUMNS.	
Liabilities.			Assets.		Notes	Minimum Rates
	DATES.				in Hands of Public.	of Discount at
Notes Issued.	(Wednesdays.)	Government Debt.	Other Securities.	Gold Coin and Bullion.	(Col. 1 minus col. 16.)	Bank of England.
£ Mlns.	1898.	£ Mlns.	£ Mlns.	£ Mlns.	£ Mlns.	Per cnt.
45,99	Jan. 5	11,02	5,78	29,19	28,14	3
46,06	,, 12	11,02	5,78	29,26	27,50	
46,77	,, 19	11,02	5,78	29,97	27,03	
47,10	,, 26	11,02	5,78	30,30	26,61	
47,40	Feb. 2	11,02	5,78	30,60	26,96	
47,38	,, 9	11,02	5,78	30,58	26,60	
47,86	,, 16	11,02	5,78	31,06	26,42	
48,37	,, 23	11,02	5,78	31,57	26,35	
48,24	Mar. 2	11,02	5,78	31,44	27,04	
47,97	,, 9	11,02	5,78	31,17	26,75	
47,57	,, 16	11,02	5,78	30,77	26,43	
47,67	,, 23	11,02	5,78	30,87	26,68	
46,63	,, 30	11,02	5,78	29,83	27,60	
44,30	April 6	11,02	5,78	27,50	28,48	4
43,76	,, 13	11,02	5,78	26,96	27,80	
44,71	,, 20	11,02	5,78	27,91	27,38	
46,12	,, 27	11,02	5,78	29,32	27,54	
48,12	May 4	11,02	5,78	31,32	27,79	
48,92	,, 11	11,02	5,78	32,12	27,56	
50,44	,, 18	11,02	5,78	33,64	27,45	
51,64	,, 25	11,02	5,78	34,84	27,45	3½
51,59	June 1	11,02	5,78	34,79	27,78	3
52,34	,, 8	11,02	5,78	35,54	27,46	
52,49	,, 15	11,02	5,78	35,69	27,32	
52,79	,, 22	11,02	5,78	35,99	27,33	
52,96	,, 29	11,02	5,78	36,16	28,26	2½
51,54	July 6	11,02	5,78	34,74	28,60	
50,78	,, 13	11,02	5,78	33,98	28,11	
50,65	,, 20	11,02	5,78	33,85	27,87	
49,79	,, 27	11,02	5,78	32,99	27,92	
49,01	Aug. 3	11,02	5,78	32,21	28,41	
49,02	,, 10	11,02	5,78	32,22	28,09	
49,50	,, 17	11,02	5,78	32,70	28,01	
49,61	,, 24	11,02	5,78	32,81	27,75	
49,55	,, 31	11,02	5,78	32,75	27,94	
49,35	Sept. 7	11,02	5,78	32,55	27,76	
49,28	,, 14	11,02	5,78	32,48	27,43	
48,42	,, 21	11,02	5,78	31,62	27,11	3
47,75	,, 28	11,02	5,78	30,95	27,51	
46,43	Oct. 5	11,02	5,78	29,63	28,16	
45,75	,, 12	11,02	5,78	28,95	27,70	4
45,67	,, 19	11,02	5,78	28,87	27,31	
46,16	,, 26	11,02	5,78	29,36	27,17	
46,34	Nov. 2	11,02	5,78	29,54	27,57	
46,45	,, 9	11,02	5,78	29,65	27,30	
46,91	,, 16	11,02	5,78	30,11	27,04	
47,42	,, 23	11,02	5,78	30,62	26,76	
46,67	,, 30	11,02	5,78	29,87	27,17	
45,91	Dec. 7	11,02	5,78	29,11	27,18	
45,74	,, 14	11,02	5,78	28,94	26,94	
45,48	,, 21	11,02	5,78	28,68	27,42	
44,23	,, 28	11,02	5,78	27,43	27,31	

—WEEKLY RETURN.

for Wednesday in each Week, during the Year **1898.**

[0,000's omitted.]

8	9	10	11	12	13	14	15	16	17	18
					BANKING DEPARTMENT.					
Liabilities.						Assets.				Totals of Liabilities and Assets
Capital and Rest.		Deposits.		Seven Day and other Bills.	DATES. (Wednesdys.)	Securities.		Reserve.		
Capital.	Rest.	Public.	Private.			Government.	Other.	Notes.	Gold and Silver Coin.	
£ Mlns.	£ Mlns.	£ Mlns.	£ Mlns.	£ Mlns.	1898.	£ Mlns.	£ Mlns.	£ Mlns.	£ Mlns.	£ Mlns.
14,55	3,39	9,19	41,44	,13	Jan. 5	14,02	34,79	17,85	2,03	68,70
14,55	3,42	9,39	40,37	,14	,, 12	14,02	33,17	18,56	2,13	67,88
14,55	3,43	11,45	38,89	,14	,, 19	14,02	32,54	19,75	2,14	68,45
14,55	3,43	13,09	37,48	,11	,, 26	14,02	31,90	20,49	2,27	68,67
14,55	3,46	14,40	35,68	,14	Feb. 2	14,00	31,46	20,44	2,34	68,23
14,55	3,47	15,45	35,96	,14	,, 9	14,00	32,33	20,78	2,47	69,57
14,55	3,49	16,88	35,12	,16	,, 16	14,00	32,33	21,44	2,44	70,21
14,55	3,48	18,59	36,76	,13	,, 23	13,99	35,05	22,02	2,47	73,52
14,55	3,75	18,81	35,91	,15	Mar. 2	13,99	35,58	21,20	2,41	73,17
14,55	3,75	18,69	35,79	,14	,, 9	13,99	35,26	21,22	2,46	72,93
14,55	3,78	18,98	36,27	,10	,, 16	14,15	35,82	21,14	2,57	73,69
14,55	3,82	19,62	35,00	,10	,, 23	14,21	35,37	21,00	2,52	73,09
14,55	3,82	19,62	36,81	,11	,, 30	14,21	39,04	19,02	2,64	74,91
14,55	3,17	12,63	36,46	,14	April 6	13,20	35,41	15,81	2,54	66,96
14,55	3,17	12,00	35,91	,09	,, 13	13,20	34,09	15,96	2,48	65,72
14,55	3,18	12,68	36,62	,09	,, 20	13,19	34,24	17,33	2,36	67,12
14,55	3,18	12,36	37,96	,11	,, 27	13,19	33,94	18,57	2,47	68,17
14,55	3,18	11,54	39,27	,13	May 4	13,19	32,77	20,33	2,39	68,68
14,55	3,19	11,40	43,52	,11	,, 11	13,19	35,78	21,37	2,44	72,78
14,55	3,21	11,93	43,14	,11	,, 18	13,19	34,31	22,99	2,46	72,94
14,55	3,21	12,04	43,45	,10	,, 25	13,20	33,61	24,19	2,36	73,36
14,55	3,16	11,78	42,41	,10	June 1	13,31	32,65	23,81	2,24	72,00
14,55	3,16	10,91	44,55	,11	,, 8	13,31	32,65	24,88	2,45	73,29
14,55	3,18	11,49	44,91	,10	,, 15	13,33	33,27	25,18	2,46	74,24
14,55	3,19	12,05	44,60	,11	,, 22	13,48	33,06	25,46	2,50	74,50
14,55	3,20	10,08	45,40	,11	,, 29	13,50	32,78	24,70	2,38	73,35
14,55	3,44	8,13	46,27	,14	July 6	13,79	33,44	22,94	2,37	72,54
14,55	3,46	7,28	46,88	,13	,, 13	13,79	33,46	22,68	2,36	72,30
14,55	3,47	7,46	47,29	,12	,, 20	13,79	33,92	22,78	2,40	72,89
14,55	3,48	6,96	46,24	,10	,, 27	13,79	33,37	21,87	2,30	71,32
14,55	3,48	6,13	45,16	,11	Aug. 3	13,94	32,61	20,60	2,27	69,42
14,55	3,48	6,57	44,44	,12	,, 10	13,94	32,00	20,93	2,29	69,16
14,55	3,50	7,80	42,44	,11	,, 17	13,86	30,77	21,49	2,28	68,41
14,55	3,51	8,20	41,56	,11	,, 24	13,91	29,90	21,86	2,25	67,92
14,55	3,75	9,31	39,94	,08	,, 31	13,41	30,35	21,61	2,25	67,63
14,55	3,75	8,59	39,81	,15	Sept. 7	13,41	29,65	21,58	2,21	66,86
14,55	3,76	8,35	40,25	,12	,, 14	13,41	29,59	21,85	2,17	67,02
14,55	3,76	9,32	36,70	,12	,, 21	12,99	27,97	21,31	2,19	64,46
14,55	3,79	9,35	37,82	,09	,, 28	12,36	30,77	20,24	2,22	65,60
14,55	3,12	8,18	37,73	,13	Oct. 5	14,24	29,08	18,27	2,12	63,71
14,55	3,13	7,18	36,46	,11	,, 12	12,90	28,24	18,04	2,25	61,43
14,55	3,14	7,30	34,72	,10	,, 19	11,41	27,77	18,35	2,28	59,81
14,55	3,15	6,70	36,85	,10	,, 26	10,50	29,61	18,99	2,25	61,35
14,55	3,13	5,95	36,36	,12	Nov. 2	10,56	28,46	18,76	2,34	60,11
14,55	3,14	5,95	34,58	,13	,, 9	10,20	26,63	19,15	2,37	58,35
14,55	3,15	5,80	35,24	,13	,, 16	9,90	26,78	19,86	2,33	58,88
14,55	3,17	6,34	35,67	,09	,, 23	10,03	26,78	20,65	2,36	59,82
14,55	3,10	6,19	37,70	,10	,, 30	10,41	29,41	19,50	2,32	61,65
14,55	3,11	5,96	35,03	,17	Dec. 7	11,10	26,86	18,73	2,14	58,83
14,55	3,12	5,79	35,41	,14	,, 14	10,94	27,21	18,80	2,05	59,00
14,55	3,12	7,09	34,38	,11	,, 21	11,30	27,98	18,06	1,91	59,25
14,55	3,14	7,13	36,28	,09	,, 28	11,30	31,06	16,92	1,91	61,19

REVENUE OF THE UNITED KINGDOM.

Net Produce in QUARTERS *and* YEARS *ended* 31st DEC., **1898-97-96-95.**

[000's omitted.]

QUARTERS, ended 31st Dec.	1898.	1897.	1898.		Corresponding Quarters.	
			Less.	More.	1896.	1895.
	£	£	£	£	£	£
Customs	5,919,*	6,110,*	191,	—	6,151,*	5,874,*
Excise	8,500,*	8,020,*	—	480,	7,950,*	7,920,*
Stamps and estate, &c., duties	4,740,*	4,590,*	—	150,	4,580,*	5,120,*
Taxes (Land Tax and House Duty)	40,	50,	10,	—	40,	40,
Post Office	3,290,	3,120,	—	170,	3,030,	2,935,
Telegraph Service	780,	740,	—	40,	715,	705,
	23,269,	22,630,	201,	840,	22,466,	22,594,
Property and Income Tax	1,530,	1,540,	10,	—	1,460,	1,390,
	24,799,	24,170,	211,	840,	23,926,	23,984,
Crown Lands	190,	180,	—	10,	160,	160,
Interest on Advances	12,	—	—	12,	—	—
Miscellaneous............	578,	464,	—	114,	468,	457,
Totals	25,579,	24,814,	211,	976,	24,554,	24,601,
				NET INCR. £765,		

YEARS, ended 31st Dec.	1898.	1897.	1898.		Corresponding Years.	
			Less.	More.	1896.	1895.
	£	£	£	£	£	£
Customs	20,975,*	21,660,*	685,	—	21,189,*	20,624,*
Excise	29,000,*	28,060,*	—	940,	27,240,*	26,660,*
Stamps and estate, &c., duties	18,960,*	18,110,*	—	850,	18,550,*	18,378,*
Taxes (Land Tax and House Duty)	2,470,	2,470,	—	—	2,520,	2,495,
Post Office	12,520,	12,050,	—	470,	11,640,	11,130,
Telegraph Service	3,120,	2,995,	—	125,	2,895,	2,765,
	87,045,	85,345,	685,	2,385,	84,034,	82,052,
Property and Income Tax	17,490,	16,880,	—	610,	16,300,	15,972,
	104,535,	102,225,	685,	2,995,	100,334,	98,024,
Crown Lands	425,	435,	10,	—	415,	410,
Interest on Advances	711,	697,	—	14,	710,	690,
Miscellaneous............	1,770,	1,993,	223,	—	1,799,	1,630,
Totals	107,441,	105,350,	918,	3,009,	103,258,	100,754,
				NET INCR. £2,091,		

* Exclusive of transfers to local taxation account.

LONDON CLEARING; CIRCULATION, PRIVATE AND PROVINCIAL.

The London Clearing, and the Average Amount of Promissory Notes in Circulation in ENGLAND *and* WALES *on Saturday in each Week during the Year* **1898**; *and in* SCOTLAND *and* IRELAND, *at the Dates, as under.*

[0,000's omitted.]

	ENGLAND AND WALES.				SCOTLAND.				IRELAND.		
DATES. Saturday.	London: Cleared in each Week on the preceding Wednesday.	Private Banks. (Fixed Issues, Dec., 1,37).	Joint Stock Banks. (Fixed Issues, Dec., 1,74).	TOTAL. (Fixed Issues, Dec., 3,12).	Average for Four Weeks ending	£5 and upwards.	Under £5.	TOTAL. (Fixed Issues, Dec., 2,68).	£5 and upwards	Under £5.	TOTAL. (Fixed Issues, Dec., 6,36).
1898.	£	£	£	£	**1897.**	£	£	£	£	£	£
Jan. 1......	105,38	44	96	1,40	Dec. 25...	2,49	5,19	7,67	3,67	2,80	6,47
,, 8......	222,65	44	97	1,41							
,, 15......	144,60	44	96	1,39	**1898.**						
,, 22......	171,78	42	94	1,37	Jan. 22...	2,30	4,85	7,15	3,52	2,65	6,17
,, 29......	134,25	42	94	1,36							
Feb. 5......	194,54	43	95	1,37							
,, 12......	137,20	42	95	1,37							
,, 19......	184,40	41	94	1,35							
,, 26......	132,45	41	94	1,35	Feb. 19 ..	2,19	4,67	6,86	3,53	2,57	6,10
Mar. 5......	190,16	41	95	1,36							
,, 12......	134,49	41	95	1,36							
,, 19......	174,38	40	95	1,35							
,, 26......	129,83	41	97	1,38	Mar. 19...	2,13	4,69	6,82	3,55	2,51	6,05
April 2......	170,67	43	1,00	1,43							
,, 9......	186,54	45	1,03	1,48							
,, 16......	112,10	44	1,01	1,45							
,, 23......	168,81	43	1,00	1,43	April 16...	2,16	4,89	7,05	3,71	2,57	6,28
,, 30......	129,96	43	1,01	1,44							
May 7......	174,06	44	1,03	1,47							
,, 14......	160,53	44	1,03	1,48	May 14...	2,41	5,17	7,58	3,82	2,54	6,36
,, 21......	171,08	43	1,02	1,46							
,, 28......	131,04	43	1,02	1,45							
June 4......	155,66	43	99	1,42							
,, 11......	139,05	42	97	1,38	June 11...	2,64	5,30	7,94	3,51	2,45	5,96
,, 18......	164,54	41	94	1,35							
,, 25......	124,72	41	93	1,34							
July 2......	159,86	42	94	1,37							
,, 9......	194,74	42	95	1,37	July 9...	2,37	5,20	7,57	3,35	2,39	5,74
,, 16......	135,42	41	92	1,33							
,, 23......	172,59	40	90	1,31							
,, 30......	128,73	40	90	1,30							
Aug. 6......	146,43	40	90	1,30	Aug. 6...	2,32	5,20	7,52	3,39	2,34	5,73
,, 13......	139,59	39	89	1,28							
,, 20......	161,81	38	88	1,26							
,, 27......	121,72	38	87	1,25							
Sept. 3......	144,64	38	87	1,25	Sept. 3...	2,30	5,14	7,44	3,31	2,38	5,70
,, 10......	141,27	38	87	1,25							
,, 17......	121,22	38	88	1,26							
,, 24......	159,11	38	90	1,28							
Oct. 1......	132,03	41	94	1,35	Oct. 1...	2,27	5,28	7,55	3,43	2,44	5,87
,, 8......	197,54	43	1,09	1,52							
,, 15......	141,86	44	1,00	1,44							
,, 22......	169,50	43	99	1,42							
,, 29......	135,78	43	99	1,42							
Nov. 5......	170,14	44	1,00	1.44	,, 29...	2,30	5,39	7,69	3,95	2,77	6,73
,, 12......	145,10	44	1,01	1,45							
,, 19......	175,69	43	1,02	1,46							
,, 26......	133,75	44	1,02	1.46							
Dec. 3......	168,82	44	1,01	1,45	Nov. 26...	2,61	5,65	8,26	3,97	2,81	6,79
,, 10......	163,44	43	99	1,42							
,, 17......	138,03	42	97	1,39							
,, 24......	198,01	42	96	1,38	Dec. 24...	2,52	5,51	8,03	3,70	2,70	6,40
,, 31... ...	127,82	41	94	1,36							

FOREIGN EXCHANGES.—*Quotations as under,* LONDON *on Paris, Hamburg, Calcutta;—and New York and Hong Kong, on* LONDON, *for* **1898.**

1	2	3	4	5	6	7	8	9
			Calcutta.				Price per Ounce.	
DATES. (Tuesdays and nearest Dates).	London on Paris. 3 m.d.	London on Hamburg. 3 m.d.	London on Calcutta. Demand.	Indian Council Bills. Minimum Price per Rupee.	New York on London. 60 d. s.*	Hong Kong on London. 4 m. d.*	Gold Bars (Fine).	Standard Silver in Bars.
1898.			*s. d.*	*s. d.*	Per cnt.	*s. d.*	*s. d.*	*d.*
Jan. 4	25·36¼	20·57	1 $3\frac{3}{4}$	1 $3\frac{13}{16}$	4·82½	1 11¼	77 10¾	26¼
,, 18	25·35	20·58	1 $3\frac{11}{16}$	—	4·82¾	1 11	77 10¾	26⅜
Feb. 1 ...	25·36¼	20·60	1 3⅝	1 $3\frac{13}{16}$	4·82¾	1 10½	77 11	$26\frac{1}{16}$
,, 15	25·37½	20·60	1 3⅝	1 $3\frac{25}{32}$	4·83½	1 10⅜	77 9½	$25\frac{13}{16}$
Mar. 1	25·40	20·62	1 3⅝	1 $3\frac{29}{32}$	4·82¼	1 10	77 9½	$25\frac{9}{16}$
,, 15	25·46¼	20·67	1 $3\frac{3}{4}$	1 $3\frac{27}{32}$	4·81	1 10¼	77 11	25½
,, 29	25·45	20·66	1 3⅝	1 $3\frac{11}{16}$	4·81	1 10¼	77 10¾	25⅝
Apl. 12	25·46¼	20·67	1 3⅝	1 $3\frac{29}{32}$	4·80	1 10⅜	77 11	25⅞
,, 26	25·47½	20·73	1 $3\frac{13}{16}$	1 $3\frac{29}{32}$	4·81	1 10⅝	77 9½	$26\frac{1}{16}$
May 10	25·47½	20·71	1 $3\frac{11}{16}$	1 $3\frac{15}{16}$	4·81¾	1 10⅜	77 9½	26
,, 24	25·43¾	20·65	1 3⅞	1 3⅞	4·84	1 10⅜	77 9	26½
June 7	25·40	20·61	1 3⅞	1 $3\frac{29}{32}$	4·84½	1 10⅝	77 10¼	27
,, 21	25·41¼	20·60	1 $3\frac{13}{16}$	1 $3\frac{13}{16}$	4·84	1 11½	77 10	27⅛
July 5	25·33¾	20·56	1 $3\frac{9}{16}$	1 $3\frac{21}{32}$	4·84½	1 11½	77 10	27⅜
,, 19	25·36¼	20·58	1 $3\frac{27}{32}$	1 $3\frac{15}{16}$	4·84¼	1 11⅛	77 10½	27⅜
Aug. 2	25·37½	20·59	1 $3\frac{13}{16}$	1 3⅞	4·83½	1 11	77 10½	27⅛
,, 16	25·37½	20·59	1 $3\frac{13}{16}$	1 $3\frac{29}{32}$	4·83¾	1 11¼	77 10¼	27½
,, 30	25·36¼	20·59	1 $3\frac{13}{16}$	1 3⅞	4·83	1 11¼	77 10¼	$27\frac{13}{16}$
Sept. 13	25·40	20·60	1 $3\frac{15}{16}$	1 4	4·84½	1 11¼	77 11½	28
,, 27	25·45	20·63	1 3⅞	1 $3\frac{29}{32}$	4·82	1 $11\frac{13}{16}$	77 11½	28¼
Oct. 11	25·45	20·63	1 3⅞	1 $3\frac{31}{32}$	4·81½	1 10⅞	77 11½	27⅞
,, 25	25·55	20·72	1 3⅞	1 $4\frac{1}{32}$	4·82½	1 11⅜	77 8¼	$28\frac{1}{16}$
Nov. 8	25·53¾	20·72	1 $3\frac{15}{16}$	1 $3\frac{15}{16}$	4·82½	1 11½	77 9¼	27⅞
,, 22	25·55	20·72	1 3⅞	1 $3\frac{15}{16}$	4·82	1 11½	77 9½	$27\frac{15}{16}$
Dec. 6	25·52½	20·72	1 3⅞	1 $3\frac{31}{32}$	4·81½	1 11½	78 –	$27\frac{9}{16}$
,, 20	25·48¾	20·70	1 $3\frac{15}{16}$	1 $4\frac{3}{32}$	4·81⅞	1 $11\frac{11}{16}$	77 11½	$27\frac{7}{16}$

* Fridays following.

An INVESTIGATION *into the* CAUSES *of* CHANGES *in* PAUPERISM *in*
ENGLAND, *chiefly during the last* TWO INTERCENSAL DECADES.
(Part I.) *By* G. UDNY YULE, *Assistant Professor of Applied
Mathematics, University College, London.*

[Read before the Royal Statistical Society, 21st March, 1899.
Sir ROBERT GIFFEN, K.C.B., in the Chair.]

CONTENTS :

Problem and Method.

THE present investigation is an application to the statistics of
pauperism of the method described by me in the *Journal* for
December, 1897,[1] that paper being intended partly as an intro-
duction to the present one. I must consequently take a know-
ledge of the method for granted; it would be useless to repeat
here in brief the explanations that I there gave at length.

The various causes that one may conceive to effect changes in
the rate of pauperism may for clearness be classified under some
five heads :—

[1] Vol. lx, p. 812.   Part 1 of the paper, pp. 812—38, is more especially
referred to.

(1.) Changes in the method, or strictness, of administration of the law.

(2.) Changes in economic conditions, *e.g.*, fluctuations in trade, wages, prices, and employment.

(3.) Changes of a general social character, *e.g.*, in density of population, overcrowding, or in the character of industry in a given district.

(4.) Changes more of a moral character, illustrated, for example, by the statistics of crime, illegitimacy, education, or possibly death-rates from certain causes.

(5.) Changes in the age distribution of the population.

The first group—changes affecting the administration of the law—is differentiated from all the others by the fact that the changes it denotes may be comparatively rapidly effected by the direct action of the responsible authorities. To whatever extent changes in administration may directly affect the rate of pauperism, to that extent must those responsible for the first change be held responsible for the second—good or bad.

But although I have classified in the above list all the causes of pauperism into separate and distinct groups, it is not to be supposed that they are themselves all independent. Changes of class (2) may affect changes of class (3), for example—changes in trade will affect the internal migration of the country. Changes in (3) again will be associated with changes in (4) and (5)—the internal migration will probably affect not only the age distribution of a given locality, but also its standard of crime, education, and so forth. And finally we may find any of the changes of the last four groups—but probably particularly (2), (3), and (5)—exerting a direct effect on the character of the administration. If, for example, we should find an increase in the proportion of out-relief associated with (1) an increase in the proportion of the aged to the whole population, and also (2) an increase in the rate of pauperism, it might be legitimate to interpret the result in the sense that changes in out-relief and pauperism were merely simultaneous concomitants of changes in the proportion of aged—the change of pauperism *not* being a direct consequence of the change of administration, but *both* direct consequences of the change in age distribution. It is evidently most important that we should be able to decide between two such different interpretations of the same facts. This the method I have used is perfectly competent to do.

Suppose a large number of unions in the country to be taken, and the changes (1) in pauperism, (2) in proportion of out-relief, (3) in age distribution and any other of the factors of classes, (2)—(4) to be tabulated for each for, say, a decade. It need not

at present be considered how such changes are to be measured, nor what statistical indices to the changes of (2)—(4) are to be used. Then suppose a characteristic or regression equation to be formed from these data, in the way described in my previous paper, first between the changes in pauperism and changes in proportion of out-relief only. This equation would be of the form—

change in pauperism
$= A + B \times$ (change in proportion of out-relief) $\Big\}$ —
where A and B are constants (numbers)   (1)

This equation would suffer from the disadvantage of the possibility of a double interpretation, as mentioned above : the association of the changes of pauperism with changes in proportion of out-relief might be ascribed *either* to a direct action of the latter on the former, *or* to a common association of both with economic and social changes. But now let all the other variables tabulated be brought into the equation, it will then be of the form—

change in pauperism $=$
$a + b \times$ (change in proportion of out-relief)
$\quad + c \times$ (change in age distribution)
$\quad + d \times \Big\}$
$\quad + e \times \Big\}$ changes in other economic, social, and moral factors
$\quad + f \times \Big\}$
     (2)

Any double interpretation is now—very largely at all events— excluded. It cannot be argued that the changes in pauperism and out-relief are both due to the changes in age distribution, for that has been separately allowed for in the third term on the right ; $b \times$ (change in proportion of out-relief) gives the change due to this factor *when all the others are kept constant*. There is still a certain chance of error depending on the number of factors correlated both with pauperism and with proportion of out-relief which have been omitted, but obviously this chance of error will be much smaller than before.

The problems that I desired to solve by the present investigation may be stated as follows :—

(1.) Taking each of the two decades 1871-81, 1881-91, to find by discussion of the changes in all the unions of the country, whether the changes in administration had a *direct* influence on the changes in pauperism, and, if so, to what extent.

(2.) If the changes in administration had such a *direct* influence, to find what proportion of the total change in each decade might be ascribed to changes in administration, and what proportion to other changes.

(3.) If possible, to ascribe such residual changes not due to

administration to their respective causes or causegroups, social or moral.

(4.) To find what effect, if any, changes in the social and economic factors have had on the administration.

It may be said of these problems on the one hand, that they are merely the problems treated by every previous writer on poor law statistics, and so somewhat threadbare; or on the other, that it would be quite hopeless to attempt to solve them with the numerical definiteness that I desire. To the first remark I might answer that the method used greatly exceeds in generality and power any previously adopted, and that consequently results of greater certainty may be attained—and possibly new results— even from the old material. In the second remark I might acknowledge some truth, but would again plead the power of the method. So far as the present paper goes, I have in fact attempted to answer questions (1), (2), and partially answer (4) for England only—Wales I have not yet handled. Question (3) is much more difficult to deal with, owing largely to the scarcity of statistical measures of moral and social changes available for single unions.

Details of Data, &c.

(1.) *Pauperism.*—By this is always meant the percentage of the population in receipt of relief of any kind, less lunatics and vagrants, on the 1st January of each year.

These figures are obtained from the "B Returns."[2]

Lunatics and vagrants have been excluded, since they come under quite different administrative measures to those affecting other classes of paupers.

This pauperism was worked out for all the unions of the country for 1871, 1881, and 1891.

(2.) *Administration.*—The only statistical measure of administrative method adopted is the ratio of numbers relieved outdoors to those relieved indoors[3]—excluding lunatics and vagrants, of course, as with the pauperism. This ratio, which I call the " Out-" relief Ratio," was also tabulated for every union for 1st January, 1871, 1881, 1891.

(3.) *Age Distribution.*—The most important point here is the proportion of the aged to the whole population ; the only question is as to what age limit to take. I have chosen this at 65 years; it is the limit used in Mr. Ritchie's old age pauperism return,[4]

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[2] These are not in the Society's library.

[3] It is the measure I have used in two papers, "On the Correlation of Total " Pauperism, with proportion of Out-relief," in the " Economic Journal," December, 1895, and December, 1896.

[4] No. 265, 1892.

and Mr. Burt's[5] return shows that it is after 65 that the rapid increase in pauperism begins.

The percentage of the population 65 years of age and over was evaluated from the census returns for every union, and tabulated for the same three years.[6] This percentage of the population over 65 I call the " Proportion of Old."

(4.) *Other Factors.*—The selection of statistical measures for changes in economic, social, or moral factors is, as already mentioned, a point of much greater difficulty. It must be remembered that we do not require merely an average measure for the whole country, such as is afforded by the statistics of exports and imports, but a measure applicable to each individual union. A measure of moral changes I have at present made no attempt to get. The first that occurred to me to try for changes in wealth and prosperity, was the rateable value of the union per head of the population. I had found this to be strongly negatively correlated with pauperism (high value corresponding to low pauperism) in a group of rural unions in 1891, and hoped that *changes* in the rateable value would serve as well with *changes* in pauperism. A good deal of time and labour was spent in making trial of this idea, but the results proved unsatisfactory, and finally the measure was abandoned altogether. Local assessments are, I believe, somewhat notoriously unsatisfactory, and probably the changes in assessment in rural unions are very sluggish in their movements.[7]

After this I had resort to quite a different measure or index, viz., simply the changes in population. One might obviously expect these changes to be in many ways important. A union with a rapidly increasing population would seem to be in a state of increasing prosperity. At the same time the character of its industries and the density of its population are also changing, and these changes may have some effect not only on pauperism but on administration. Mr. Loch has several times put forward the view of changes in population affecting rates of pauperism.[8] Mr. Booth

[5] No. 36, 1890. The percentage of those aged 65—70 relieved is double the percentage of those aged 60—65.

[6] The proportions for 1891 are given in Mr. Booth's " Aged Poor Condition," Appendix A, and served to check my figures for that year.

[7] For example, take the following extract from the " Daily Chronicle," 19th August, 1897—it is reported from the East Ashford Union that " the whole of the " farmers have petitioned the assessment committee to reduce the rateable value " of their holdings by 30 per cent. The committee have decided to make a per- " manent reduction of 25 per cent." It is obvious that this method of leaving things alone for a long while and then making sweeping reductions, would tend to make changes in rateable value quite meaningless.

[8] *E.g.*, " Economic Journal," iv, p. 473, and elsewhere in same article. I am

has gone further and put forward the view [9] that "increased wealth "is the cause alike of (*a*) decrease of pauperism, (*b*) increased "proportions of urban populations, and (indirectly) (*c*) changed "policy of administration"—less out-relief being usually given in urban than in rural unions, and so the decrease of out-relief due to the "urbanisation" of the country. The use of "changes "of population" as one variable will enable us to test this theory.

These four variables were the only ones finally used, viz. :—

Pauperism,
Out-relief Ratio,
Proportion of Old,
Population.

They are all straightforward quantities, and all quite sufficiently reliable for the purposes of this investigation. The third only—proportion of old—is rather uncertain in urban unions.

Measurement of Changes.—The changes in all these quantities were invariably measured as percentages. Thus, for example, let P_1 be the pauperism of any union in 1871, P_2 its pauperism in 1881, then by the change in the pauperism during the decade I mean

$$100 \left(\frac{P_2}{P_1} - 1 \right)$$

per cent. To avoid dealing, however, with positive and negative signs, I have frequently used not the percentage change, but simply the percentage ratio, *e.g.* :—

$$100 \, \frac{P_2}{P_1}$$

the value of the pauperism in the later year, taking the earlier year as 100.

Grouping of Unions.—It seemed desirable for several reasons not to take all the unions of the Kingdom together, but to split them up into two or three groups, graded from rural to urban. For this purpose I have used the classification by density of a former paper,[10] a classification which was convenient in use and gave groups of a suitable size. The groups are as follows :—

not sure however whether Mr. Loch is not thinking solely of the effect of increase of population in lowering the age distribution.

[9] "Economic Journal," vol. vi, p. 74, 1896.

[10] "On the Correlation of Total Pauperism with Proportion of Out-relief— "Males over 65."—"Economic Journal," December, 1896, p. 617. There were a few unions wrongly assorted in that paper.

Table A.—*England only.*

	Number of Unions in Group.	
	1871-81.	1881-91.
I. Rural. Density 0·3 person per acre or less	236	236
II. Mixed. Density 1 person ,, ...	206	207
III. Urban. Density greater than 1 per acre	103	105
IV. Metropolitan (with West Ham and Croydon)	32	32
	577	580

The densities referred to are densities in 1891,[11] and were taken from Appendix A to Mr. Booth's "Aged Poor." The limit of density (0·3) to the "Rural Group" was suggested by the Agricultural Unions investigated by the Labour Commission. The mean density of these (unweighted) was 0·25 per acre, but the slightly higher limit here adopted included thirty-four out of the thirty-eight. The lower limit to the "urban" group—one person per acre—was suggested by Mr. Booth's Group XIV,[12] *et seq.* (mostly urban or semi-urban, and so on). The grouping is of course quite rough. I only claim that Group III is *on the average* urban in character,—it contains all the great town unions—while group I is *on the average* rural. The classification seems to be very well justified by results. Of course when one considers the way in which so many unions are made up of a piece of town and a piece of country, or a whole town with a lot of surrounding country, it is obvious that any definition of an "urban union" must be somewhat arbitrary.[13]

As I have already mentioned, the present paper deals with ENGLAND ONLY, not Wales.

Boundary Changes.—A certain practical difficulty occasionally arises from alterations of boundary in the unions concerned. In estimating the changes of population, such alterations have been allowed for by correcting the area for the later date to its boundary at the earlier date. The data for doing this are very conveniently collected in the Registrar-General's decennial supplements. But

[11] The same unions being retained in the same group for each period. The differences in numbers are due to creations of new unions.

[12] "Aged Poor," p. 86.

[13] *Cf.* Major Craigie's classifications of counties into urban and rural by density, percentage of land to total rateable value, proportion employed in agriculture, and proportion living in urban sanitary districts.—"The English Poor Rate." *Journal of the Royal Statistical Society*, vol. li, p. 467, 1888. Also Mr. Booth, "Aged Poor," note on p. 6. Any union counted as urban or semi-urban, in which *no portion particularised in the census* has a density less than 1 person per acre, and so forth.

as regards the other variables, the boundary changes have been simply neglected. I do not see how this can lead to sensible error. The change in boundary could hardly affect any relation between proportion of old, or out-relief ratio, and pauperism, unless it very largely altered the industrial character of the union. But changes not only of sufficient extent, but of such a character as to do this are extremely few. The following is a brief summary of the effects in shifting population of all the changes in both decades;[14] it will be seen that the alterations of 1871-81 were not only more in number, but more important than those of 1881-91. There were nine alterations of boundary in the earlier decade in which a shift of population of 20 per cent. or more was produced, and only two in the later decade, or 1·6 per cent. and 0·3 per cent. respectively of the total number of unions investigated.

Table B.

	Number Producing a Change in Population (per Cent.) of									Total.
	<1	1—	2—	5—	10—	20—	30—	40—	50 and upwards.	
1871–81	1	4	8	5	1	2	4	—	3	28
'81–91	8	3	3	2	2	1	1	—	—	20

Frequency Tables and Fundamental Constants.

The first step towards the calculation of the regression equation in the case of a moderately large number of observations, is the formation of a "frequency table" for every possible pair of the variables. These were formed for each of the groups of unions, for both decades, except in the case of the metropolitan group which contained only thirty-two unions; only the figures themselves were tabulated for this group. Altogether the results were contained in thirty-eight tables, which I had desired to include in the Appendix. As, however, they would have occupied twenty or thirty pages of the *Journal*, the Council considered they would have made the paper too long for insertion. The manuscript tables are in the hands of the Assistant Secretary, and can be seen by anyone who desires to examine them.[15] The changes were, with a few exceptions, grouped by steps of 10 per cent., *e.g.*, 15—25 25—35, &c.

The original values of the pauperism, out-relief ratio and proportion of old in each year were worked out to three figures, and from

[14] Of course there are numerous small changes of parish boundaries, &c., which have not altered the boundary of the union.

[15] Seven tables are now given as specimens in the Appendix, pp. 281—286.

these the percentage ratios were worked to the nearest unit per cent. An exception had, however, to be made in the case of any ratio corresponding exactly to a dividing line between two groups, *e.g.*, 55 per cent.; in this case the ratio must be carried a figure further, if it be then 54·7 or 54·9, it will go into the Group 45—55, but if it be 55·1 or 55·3, it will be booked into row or column 55—65. If, however, the ratio really worked out to exactly 55, without approximation, then the figures on which it was based were carried out to another digit or more, and the percentage ratio recalculated to as many figures as need be; this might alter it from, say, 55 to 55·002, and it would go into Group 55-65. This procedure never failed to save the necessity of splitting a union between two rows or columns.[16]

After the frequency tables have been formed, the fundamental constants, viz., means, standard deviations, and correlation coefficients must be calculated. These are given in Tables I and II of the Appendix. There being four groups of unions and six correlation coefficients to each group, there are twenty-four correlation coefficients (gross or total) to each decade, or forty-eight in all.

The means are, of course, simply the averages of the frequency distributions, not loaded averages in which each union is weighted proportionately to its population. Thus the average of the changes of pauperism in any group is *not* the change in the percentage of the whole population of the group in receipt of relief, nor is the average of the changes in proportion of old the same as the change in the percentage of the whole population over 65. Perhaps it may also be added that neither would the mean of the unloaded changes (as given) be the same as the change of the unloaded means. The differences between the two kinds of average are not as a rule very large, being generally of the order of 2 or 3 per cent.; the greatest divergences occur in the case of the small metropolitan group.

When all the fundamental constants detailed above are given, any desired regression equation can be immediately calculated without further reference to the frequency tables.

Regression Equations of Pauperism.

A mere inspection of the frequency tables and the table of means (Table 1, Appendix) served to bring out some general points of considerable importance. Such an inspection showed for instance that pauperism and out-relief, and proportion of old

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[16] For working out the three digit ratios I used a slide rule (50-cm. Gravet, or else a 2-ft. Hannyngton rule). For longer arithmetic, the " Brunsviga " arithmometer proved itself invaluable. Without such mechanical aids to calculation I could scarcely have undertaken the present work.

TABLE C.—*Table of Regression Equations of Pauperism on other Variables for all the Groups of Unions.*

1	2 Group.	3	4	5 Times Change in Out-Relief Ratio.	6 Times Change in Proportion of Old.	7 Times Change in Population.	8 Standard Deviation. (1) Round Regression Equation.	9 Standard Deviation. (2) Round Mean.	10 Per Cent. (1) on (2).
1871-81	Rural...............	Change per cent. in pauperism is equal to	− 27·07	+ 0·299	+ 0·271	+ 0·064	14·12	16·17	87
	Mixed		− 26·15	+ 0·282	+ 0·219	+ 0·085	15·56	17·19	91
	Urban		− 4·38	+ 0·571	− 0·094	− 0·067	20·70	25·33	82
	Metropolitan......		+ 13·19	+ 0·755	− 0·022	− 0·322	16·16	16·23	63
1881-91	Rural...............		− 14·10	+ 0·243	+ 0·333	+ 0·178	16·38	19·46	84
	Mixed		− 11·14	+ 0·172	+ 0·470	− 0·187	16·30	18·04	90
	Urban		− 16·72	+ 0·344	+ 0·767	− 0·076	16·22	20·92	78
	Metropolitan......		+ 1·36	+ 0·324	+ 1·37	− 0·369	22·86	29·16	78

make this standard deviation as small as possible.[18] Now the crudest estimate of the changes in pauperism would be made by estimating the *mean change* in every case; this would result in making a standard error identical with the standard deviation of the changes themselves round their mean, which is given in Col. 9 of Table C, p. 259 (copied from Table 1 of the Appendix). The percentage of the first standard deviation on the second is a convenient measure of the increase in accuracy of estimate, and is given in Col. 10.

We may now proceed to consider these regression equations from the point of view of (1) changes not accounted for; (2) changes credited to fluctuations in proportion of old or in population; (3) changes credited to alterations of out-relief ratio.

(1.) *Unaccounted Changes.*

Two totally different quantities must be carefully distinguished under this head, both, however, indicative of the inadequacy of the variables used to completely account for all the changes that have taken place in the rate of pauperism.

First there is the percentage of standard deviation round regression equation to standard deviation round mean, given in Col. 10 of Table C. This is a measure of the extent to which *all the changes in all the individual unions* have been accounted for, or explained. It must be noted that we need never expect to do this entirely, for two reasons: (1) Because a certain proportion of all the changes, and of each change, must be of a purely chance character, *i.e.*, due to unspecifiable causes like the changes in numbers thrown in casts of dice. The standard deviation of such changes one would, however, expect to be small relatively to the total standard deviations that occur (Col. 9, Table C). (2) Because we have only used a linear relation between pauperism and the other variables; the real relation is almost certainly more complex. Making full allowance, however, for both of these facts, it ought to be possible to reduce the standard deviation round the mean by more than the 10 per cent., which is all that is accomplished (in both decades) in the "mixed group." The rural group is a little better with 13 per cent. reduction in 1871-81 and 16 per cent. in 1881-91. Only in the metropolitan group does the reduction attain the comparatively satisfactory magnitude of 37 per cent. in the earlier decade.

But in addition to this failure to entirely account—or even

[18] *Vide* paper cited "On the Theory of Correlation," *Journal of the Royal Statistical Society*, December, 1897, p. 816.

largely account—for the individual variations, there is the failure to account for the *change in mean*, indicated by the constant terms of the regression equations (Col. 4). Thus in the decade 1871-81 there was in the rural group a decrease of 27 per cent. in pauperism unaccounted for by any of the variables used, and similar decreases of 26 per cent. in the mixed group, 4 per cent. in the urban group. In the metropolitan group, on the other hand, the unaccounted change was an increase of 13 per cent. The actual change was a great decrease (50 per cent.), but alterations in out-relief ratio, &c., would account for a greater, so there is a balance left on the increase side of the account.

Now these " unaccounted " changes vary in a most remarkable way from group to group. Whatever the factors to which they are due, there was, in the earlier decade, a large unaccounted decrease in the rural group tailing off to a considerable increase in the metropolitan group, while in the later decade there are unaccounted decreases of roughly equal magnitude (11—17 per cent.) in the first three groups, and a very small increase in the metropolitan group. Thus in both decades the metropolis appears somehow to have come off worst.

Some light will be thrown on these changes by subsequent discussion.[19] So far as one can say at present, they may be due either (1) to administrative changes, of which out-relief ratio is an inadequate measure, or (2) to economic changes, &c., of which the fluctuations of population are an imperfect index. In any case, it must be carefully borne in mind that they are quite different in magnitude and direction to the changes in *total* pauperism.

(2.) *Changes in Proportion of Old and Population.*

In considering either of these variables *by itself*, one might be greatly led astray, owing to the very close connection between the two. Taking the " proportion of old " by itself, there might be an apparent considerable change of pauperism due to a small change in proportion of old. But in point of fact only a small fraction of the whole change in pauperism might be so due *directly*, for the change in proportion of old will be in general accompanied by a corresponding change in population, indicative of a change in general prosperity. Hence the real interpretation of the facts might be that the change in pauperism was due *partly* directly to the change in proportion of old, *partly* to the change in prosperity, *indicated indirectly* by the changes in proportion of old

[19] *Cf.* pp. 274 *et seq.* below.

and in population. Precisely similar remarks will hold good with regard to the changes of population. The changes in age distribution that they connote, and the changes in prosperity that they indicate, must be kept carefully distinct. In the regression equations of Table C this is done automatically; the changes in proportion of old and in population both enter separately, and the corresponding regression coefficients give the changes due to either variable independently of the other, *i.e.*, when the other is kept constant.

Now, in looking down Col. 7 (population) of Table C, the first point that catches the eye is that three of the regression coefficients are not negative, as one would in general expect, but positive, viz., the coefficients for the rural and mixed groups in 1871-81, and for the rural group in 1881-91. That is to say, in these groups —or at all events the rural group, for which the results are the same in both decades—the more the population increased or the less it decreased, the more did pauperism increase or the less did it decrease (age distribution being kept constant). Thus, *so far as the evidence goes*, the decrease of population in the rural group was beneficial, though the accompanying increase in proportion of old more than counterbalanced the advantage. "So far as the "evidence goes" is a necessary qualification, for, in point of fact, the probable error of the regression in 1871-81 is about 1·26 times the regression coefficient itself, and in 1881-91 about 0·70 of it. A coefficient—or the sign of a coefficient—is not, however, necessarily in error, even if it be within the probable error, and the signs of the two coefficients for the rural group agree.

If any weight can be attached to the sign, the result is instructive. First, it suggests the economic reasonableness of the "rural exodus." The fact that pauperism has decreased most where population has decreased most, is suggestive of severer pressure than the lurid attractions of town on the country-bred mind. Secondly, I think the result demands some scrutiny of the idea—perhaps I should say my idea—that the rate of increase of population would be a measure of the rate of increase of prosperity. I intended by the use of "prosperity" in this connection to imply some measure of, so to speak, "prosperity per "head," *e.g.*, rateable value of the union per head, or something of that sort. Now if the total rateable value of a union increases faster than its population, the value per head will increase; if again the total value be decreasing, but the population decrease slower, the value per head will decrease—but only under these circumstances. That is to say, if in either case the changes in population *lag behind* the changes in available wealth, there will be a positive *association* of growth in population with growth in

prosperity. This was partly the idea on which I went in using changes in population as one of the variables.

But this positive association need not necessarily imply a positive correlation between deviations, as a little consideration will show. Suppose the total rateable value, for instance, in each of a certain group of unions to decrease by about the same amount. The population in them all will then probably decrease— this is the *positive association.* But the value per head will have decreased least in those unions where the population has decreased most, and this is *negative correlation.*[20] This, I think, is roughly the state of affairs in the rural group. The decreasing population pointing to decreased prosperity, but being beneficial inasmuch as it makes the decrease less than it would otherwise be. This double-sidedness renders change in population however a somewhat unsatisfactory measure.

As the correlation of *pauperism* with population is negative in all the remaining groups, the conditions existing in them must be quite different. If the wealth-per-head in them be increasing, then it is increasing most rapidly in those unions where the population itself is increasing most rapidly.

Passing on now to the regressions of pauperism on proportion of old, there are again two exceptions to be noted to the natural sign, viz., in the urban and metropolitan groups in the earlier decade, and the question again arises what interpretation is to be put upon this. First of all the regression coefficients are very small with regard to their probable errors, the probable error in the urban group being 1·91 times the regression itself, and 4·42 times it in the metropolitan group. But again the similarity between the equations in the two similar groups is rather striking. If any physical interpretation is to be sought, it can only lie in the omission of some variable with a strong correlation of either sign with pauperism, but the opposite sign with proportion of old. At the same time it is probable that the two regressions though positive should be small.

I think the following considerations throw some light on the way the partial regressions of Pauperism on Proportion of Old may vary. Let

p_1 = total population in the earlier year (*e.g.*, 1871) in any union
or group of unions,

p_1' = population over 65 years of age   ,,   ,,   ,,
π_1 = total paupers in the earlier year,
π_1' = paupers over 65   ,,   ,,

[20] Negative correlation of prosperity with population, or positive of pauperism with population, as in the rural group.

and let $p_2 \; p_2' \; \pi_2 \; \pi_2'$ be the same quantities in the later year (*e.g.*, 1881). Then let

$$(1 + x) \frac{\pi_1}{p_1} = \frac{\pi_2}{p_2}$$

$$(1 + y) \frac{p_1'}{p_1} = \frac{p_2}{p_2}$$

$$(1 + z) \frac{\pi_1'}{p_1'} = \frac{\pi_2'}{p_2'}$$

$$(1 + w) \frac{\pi_1'}{\pi_1} = \frac{\pi_2'}{\pi_2}$$

So that $100x$, $100y$, $100z$, $100w$, are the percentage changes in pauperism, proportion of old, old age pauperism, and proportion of old to total paupers respectively. Then we have at once

$$(1 + x) = (1 + y) \frac{(1 + z)}{(1 + w)}$$

for any one union; or in words — the percentage ratio of pauperism is equal to the percentage ratio of proportion of old multiplied by

$$\frac{\text{percentage ratio of old age pauperism}}{\text{percentage ratio of proportion of old to total paupers.}}$$

The smaller the fraction the smaller will be the percentage ratio of pauperism relatively to the percentage ratio of proportion of old. Now in 1871-81 the increase in the proportion of non-able-bodied to total paupers was very large, and so probably the increase in the proportion of old to total paupers. This would make the above fraction small, and consequently the net regressions (pauperism on proportion of old) small or even negative—as they are. In the following decade, however, there was comparatively little change in the proportion of non-able-bodied or old, and the regressions might be expected to increase—as they do.

This discussion has been rather lengthy, owing to the complexity of the changes involved. Summarising, we may say : The regressions of Pauperism[21] on Population tend to be negative in the more urban, but positive in the more rural, groups, the decrease of population in the latter being consequently (*per se*) beneficial. The regressions of pauperism on proportion of old are small in the earlier decade, relatively large ($0\cdot3$—$1\cdot4$) in the later decade, this increase being probably due to the smaller change in the proportion of old to total paupers.

The next group of regression coefficients afford no difficulties corresponding to those dealt with above.

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[21] I have omitted the words "changes in" here and in one or two other places, to avoid the continual repetition of the phrase. As I have not dealt with anything but changes, this can hardly lead to confusion.

A. .... *Total pauperism – Jany. 1st.*
B. .... *Indoor pauperism – Jany. 1st.*
C. .... *Marriage rate.*
D. .... *Vagrancy.   – Jany. 1st.*

(3.) *Changes in Out-relief Ratio.*

The net or partial regressions of pauperism on out-relief ratio are positive without exception. Since they are partial and not total coefficients, the correlation they indicate between increase of out-relief ratio and increase of pauperism (and *vice versâ*) cannot be explained by any imagined correlation of decrease of out-relief with decrease of old or increase of population. Unless, and until, then, it can be shown that some other quantity whose changes are closely correlated with changes in out-relief ratio can account for this observed association, there is no alternative to considering the result as indicating a direct influence of change of policy on change of pauperism. I hope to give further investigations on this important point in my next paper; so far as these investigations have gone at present, they indicate that while the out-relief ratio does tend to rise in bad times and fall in good times (as one might expect), such causation is entirely inadequate to account for the phenomena observed, at all events in the decade 1871-81.

The following may for the present carry some conviction. I have drawn on the annexed plate the following four curves in the order given from top to bottom :— [22]

(1.) Total pauperism.

(2.) In-door pauperism. Lunatics and vagrants excluded in both cases; both curves based on 1st January returns, and for England *and Wales.*

(3.) Marriage-rate, England and Wales.

(4.) Vagrants per thousand of the population—1st January, and England and Wales also.

All these curves are drawn to different scales, so as to throw up their respective fluctuations to about the same amplitude. Now it will be noticed that the curve of in-door pauperism follows the fluctuations of the marriage-rate[23] inversely, rising when it falls and falling when it rises with, on the whole, most remarkable regularity. The one marked divergence occurs simultaneously with the abnormal fall in marriage-rate at some time during the period 1873-79. The curve of vagrancy exhibits a similar but much less strongly marked agreement. But when we turn to the curve of total pauperism, we see that there is nothing whatever in the marriage-rate to account for the tremendous fall between 1870

[22] For figures on which the curves are based, together with out-relief ratio, *vide* Table 41 of Appendix.

[23] I took the marriage-rate as the economic barometer, as it seemed to follow the fluctuations of pauperism more closely than the curve of exports per head. It is interesting to compare this plate with the diagram of Dr. Ogle ("Marriage-"Rate and Exports," *Journal of the Royal Statistical Society,* Part II, 1890), and the more recent work of Mr. R. H. Hooker on the same subject ("Proceedings," Manchester Statistical Society, January, 1898).

and 1880. We would expect a corresponding large rise in the marriage-rate; there is nothing but an abnormal fall. The maximum of in-door pauperism in 1880 is only slightly less than its maximum of 1869-70; the maximum of total pauperism is only a little ripple in the general curve. Now if the curves of in-door pauperism and of vagrancy have this general correspondence with each other and with the marriage-rate, it can only be concluded that they are chiefly influenced by the general social and economic condition of the country. But the curve of total pauperism shows no such correspondence in its greatest change, but only in its "ripples." Therefore this greatest change must have been effected by some factors other than the economic; administration seems the only alternative.

To pass on to another point: although the regressions of change of pauperism on change of out-relief ratio show such a satisfactory agreement in sign, they differ very considerably in magnitude. The regressions in the mixed and rural groups are in both decades smaller than in the urban and metropolitan groups, and comparing group with group the regressions in the second decade are uniformly smaller than in the first. Now does the latter fact imply a decrease in the *efficiency* of the anti-out-relief policy?

The point is arguable, but I think it does not. Consider a union or group of unions in which the out-relief ratio is reduced by equal steps in, say, two successive decades; and suppose the reduction to be perfectly "effective," in the sense that none of those refused out-relief come to the house. Further, suppose industrial or economic conditions to remain unaltered. We may then suppose (*vide supra*) the rate of in-door pauperism to remain unaltered. Let I be this unaltered rate of in-door pauperism, and $O_1 O_2 O_3$ the three rates of out-door pauperism at the beginning, middle, and end of the twenty years period considered. Then the condition that the percentage reduction of out-relief ratio shall be the same in the two decades, gives

$$\frac{O_2}{O_1} = \frac{O_3}{O_2} \qquad .. \qquad .. \qquad .. \qquad (1)$$

The percentage reduction of pauperism in the first decade is

$$\frac{(I + O_2) - (I + O_1)}{(I + O_1)} = \frac{O_2 - O_1}{I + O_1}$$

and a similar expression holds of course for the second decade. Hence

$$\frac{O_2 - O_1}{I + O_1} > \frac{O_3 - O_2}{I + O_2}$$

if

or if

$$\frac{O_1}{I + O_1}\left(\frac{O_2}{O_1} - 1\right) > \frac{O_2}{I + O_2}\left(\frac{O_3}{O_2} - 1\right)$$

$$O_1 > O_2 \qquad .. \qquad .. \qquad .. \qquad (2)$$

But this is true *ex hypothesi.*   That is to say, although the
reduction of out-relief ratio continues to be "perfectly effective"
in the natural sense above given, the accompanying reductions in
pauperism will necessarily be reduced.   We may expect then
future regressions of change of pauperism on change of out-relief
ratio to be somewhat smaller than in 71—81.   But I think a
further cause has come into play, viz., that very large and rapid
decreases in out-relief ratio are more effective in proportion to
their magnitude than small ones.   I have drawn fig. (1) to

FIG. 1.

(1) Rural group.
(2) Mixed   „
(3) Urban   „
(4) Metropolitan group.

Per cent. out-relief ratio in later year on out-relief ratio in earlier year.

illustrate the point, the partial regressions of pauperism on out-
relief being there plotted to the mean changes in out-relief ratio,
and the pair of observations corresponding to each group joined
by a straight line.   The whole trend of these lines is downwards,
from left to right, the lower regressions all corresponding to
smaller reductions or small increases in out-relief ratio.   There
are no data to suggest what would be the regressions for large
increases.   Judging, however, from the appearance of the tail
ends of the correlation tables, I do not think they would attain
high values, probably asymptoting to some such figure as

0·15—0·25. Obviously there still remains over, besides this difference due to mean change, a considerable difference due in some way to the differences of the groups; all the straight lines of fig. (1) standing quite apart from one another. These might conceivably be due to differences of the initial rates of pauperism in 1871, on which the reductions of out-relief were made, but I have not had time to work up this point.

Relative Importance of the Different Changes Discussed.

After this review of the magnitudes and signs of the different regressions, it is necessary to discuss the importance of the changes in each of the variables, as measured by its contribution to the total mean change in pauperism. It is obvious that a variable might have a very high correlation with pauperism, and yet contribute next to nothing to any change in the same if it changed but little itself. The importance of the variable in the above sense depends both on the mean change and on the regression.

Using the regression equation for each group from the former Table C, p. 259, we may, however, make out a balance sheet for each group. Thus, for example, in the rural group 1871-81,[24] there was, to begin with, an *unaccounted* decrease of 27·1 per cent. Then (Appendix, Table 1) there was a decrease in out-relief ratio of 27·9 per cent.; treating the whole group as if it were one big union this would account for a further decrease of $0·299 \times 27·9 = 8·3$ per cent. Then there was an increase of old of 3·6 per cent. accounting for an *increase* of pauperism of $0·271 \times 3·6 = 1·0$ per cent. Finally, a decrease of population of 2·5 per cent., equivalent (as the regression of pauperism on population is positive for the rural group) to a decrease of pauperism of $0·064 \times 2·5 = 0·2$ per cent. So the account stands thus :—

Pauperism.

DECREASES PER CENT.		INCREASES PER CENT.	
To unknown factors	27·1	To 3·6 per cent. increase old........	1·0
,, 27·9 per cent. decrease out-relief ratio	8·3		
,, 2·5 per cent. decrease population	0·2		
	35·6		——
	1·0		1·0
Balance decrease	34·6		——

The balance is, of course, from the construction of the regres-

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[24] I have used a digit less here than in the other tables, so there are differences of a unit in the last place. All the means used below are of course the unloaded means of Table 1.

sion equation, the same as the actual decrease, *i.e.*, the actual decrease is the balance struck between the opposing factors. To save space I have entered all the remaining "balance sheets," constructed in precisely the same way, in tabular form (Table D) below.

This table brings out extremely clearly the varying importance of the changes due to out-relief in the different groups. In the decade 1871-81, for instance, the changes due to changes in out-relief ratio are only about a quarter of the whole in the mixed and rural groups, three-quarters of the whole in the urban group,

TABLE D.—*Table of Balance Sheets.*

Period.	Group.	Change per Cent. in Mean Pauperism Credited to the Account of Changes in				Total = Actual Change.
		Unknown Factors.	Out-Relief Ratio.	Proportion of Old.	Population.	
1871–81	Rural..................	− 27·1	− 8·3	+ 1·0	− 0·2	− 34·6
	Mixed	− 26·1	− 8·5	− 0·2	+ 0·9	− 33·9
	Urban	− 4·4	− 20·3	+ 0·1	− 1·4	− 26·0
	Metropolitan........	+ 13·2	− 56·5	0·0	− 6·4	− 49·7
1881–91	Rural..................	− 14·1	+ 3·8	+ 2·5	− 0·4	− 8·2
	Mixed	− 11·1	+ 1·2	+ 2·6	− 1·7	− 9·0
	Urban	− 16·7	− 0·7	+ 4·5	− 1·3	− 14·2
	Metropolitan........	+ 1·4	− 3·0	+ 10·5	− 4·2	+ 4·7

and 14 per cent. *more* than the whole in the metropolitan group, *i.e.*, there is an increase due to some other factor discounting the decrease due to reduction of out-relief. The whole results are grouped in the following table :—

TABLE E.

Group.	Change in Pauperism per Cent.		Per Cent. (2) on (1).
	(1) Total.	(2) Due to Change in Out-Relief Ratio.	
1871–81 Rural........................	− 34·6	− 8·3	+ 24
Mixed	− 33·9	− 8·5	+ 25
Urban	− 26·0	− 20·3	+ 78
Metropolitan............	− 49·7	− 56·5	+ 114
1881–91 Rural........................	− 8·3	+ 3·8	(− 46)
Mixed	− 8·9	+ 1·2	(− 13)
Urban	− 14·2	− 0·7	+ 5
Metropolitan............	+ 4·7	− 3·0	(− 64)

It is obvious from this table that not only do the results differ greatly from group to group, but that taken as a whole the results

for the two decades are totally different. A very large part of the decrease in pauperism in 1871-81 was (as already suggested by the marriage-rate curve) due to change of administration; practically none of the decrease in the later decade can be so explained.

These important figures of Table E can in some cases be roughly checked by an independent method. Taking the frequency table for any one group for pauperism and out-relief ratio, find the mean change in pauperism for those unions in which there was no sensible change in out-relief ratio. This will give the change in pauperism *not* due to altered administration, and, by subtraction from the mean change in all unions, the portion that *is* due to changed administration. The figures so obtained correspond of course to the gross and not the net regressions; *i.e.*, in the above working[25] it is assumed that other conditions in the two sets of unions are the same. The check is further very rough, as there are very few unions in the zone of "no change in out-relief ratio" (or changes only between $\pm$ 5 per cent.). The following will serve as illustration. In the rural group 1871-81 the mean change in pauperism in the array of unions for which the changes in

TABLE F.

Group.	Number of Unions used for Method (2).	Change in Mean Pauperism due to Changes in Out-Relief Ratio, estimated by	
		Method (1), Table E.	Method (2).
1871-81 Rural	19	$-$ 8·3	$-$ 8·8
Mixed	12	$-$ 8·5	$-$ 6·4
Urban	3	$-$ 20·3	$-$ 16·0
Metropolitan............	....	$-$ 56·5	....
1881-91 Rural	24	$+$ 3·8	$-$ 1·9
Mixed	36	$+$ 1·2	$+$ 1·1
Urban	37	$-$ 0·7	$-$ 4·7
Metropolitan............	4	$-$ 3·0	$-$ 2·0

out-relief ratio lay between $\pm$ 5 per cent. was a decrease of 25·8 per cent. The mean change in pauperism for the whole group was a decrease of 34·6 per cent. Therefore the change due to administration must have been roughly 34·6—25·8, or a decrease of 8·8 per cent. In the case of the urban group 1881-91 I have included three arrays corresponding to the changes in out-relief ratio between $\pm$ 15 per cent. The result from the one row by this

[25] Strictly, for "due to" read "associated with." Changes in proportion of old and in population were much the same in the two groups in all cases. The assumption could not have been made, I imagine, had the kingdom been taken as a whole.

method diverged considerably from the result obtained from the regression equation. The method was inapplicable to the metropolitan group for 1871-81, as there were no unions that did not make large changes in their out-relief ratio. The results for all the other groups are collected in Table F above, and are very satisfactory on the whole,[26] the agreement being quite as good as one could expect, considering the small numbers on which the results of the second method are based. The results of the regression equations, being based on the whole number of unions in each group, are much the most reliable of the two.

The next problem is to obtain in some way from Table E an average for the whole kingdom. Any average, it may be noted, will be a rather meaningless quantity, when the figures for different groups vary as much as they do for the decade 1881-91 : to take an imaginary example, suppose the figures for two halves of the kingdom were :—

Changes in Pauperism.

Total.	Due to Change in Out-Relief Ratio.	
− 20	+ 10	
+ 10	− 20	

The two halves being about equal in population, an average would give total decrease in pauperism 10 per cent., decrease due to change in out-relief 10 per cent. But yet it would be misleading to say that change in out-relief would account for the whole change in pauperism. It would account for a change equal to that which took place, but the differences between the groups must in such a case be borne in mind. This difficulty does not occur to the same extent in the earlier decade, as there are no increases, but only decreases both in pauperism and out-relief ratio.

TABLE G.

Group.	Population (in Millions).			Percentage Distribution.	
	1871.	1881.	1891.	1871-81.	1881-91.
Rural......................	3·68	3·60	3·53	16	14
Mixed	5·92	6·58	7·19	27	27
Urban	8·23	10·08	11·78	40	42
Metropolitan	3·44	4·14	4·73	17	17

[26] The result for the rural group 1881-91 is exceptional, and in contradiction to everything else as it stands. The results of all three arrays, with out-relief changes between ± 15 per cent., are somehow abnormal in this group.

Such as the figures are, I thought it best to strike the average by loading each group in proportion to its mean population during the decade, averaging the total decreases and decreases credited to out-relief separately, and then taking the ratio of these separate averages. The populations of the groups to the nearest 10,000 are given in Table G above, and the mean percentage distribution for each decade in the last two columns. Using these percentages as loads, I find for the whole of England in the decade 1871-81—

<div align="right">Per Cent.</div>

Mean decrease in pauperism (total) .... 33·5
,, due to change in out-relief ratio .... 21·3

21·3/33.5 = 0·64—*i.e.* about five-eighths of the whole decrease of pauperism in the earlier decade was due to changed administration. I think this estimate is roughly borne out by the returns for the Kingdom as a whole. In England, as a whole, pauperism decreased by 38 per cent. during the decade 1871-81. Out-relief ratio decreased by 44 per cent.[27] For a decrease of this magnitude the regression (*vide* fig. 1, p. 267) would be about one-half, or the decrease of pauperism due to decrease of out-relief about 22 per cent. 22/38 = 0·58, against 0·64, above.

For the second decade, as I have said, the process of averaging is not very satisfactory. The results are :—

<div align="right">Per Cent.</div>

Mean decrease in pauperism (total) .... − 8·73
,, increase due to increase of out-relief ratio........ + 0·06

Thus, according to these figures, change of out-relief contributed practically nothing one way or the other to the change of pauperism during the decade. But the figures are comparatively unreliable. In England, as a whole, the decrease of pauperism was 15 per cent., against the 8·7 per cent. above; and there was a *decrease* of 9 per cent. in out-relief ratio, against a very slight increase obtained by our method of averaging. For a decrease of 9 per cent. of out-relief the regression (*vide* fig. 1, p. 267) would be about 0·3, so this would credit a decrease of 2·7 per cent. of pauperism to change in out-relief, or about one-fifth to one-sixth of the whole. Considering this disagreement, I do not think one can say more than that changes in out-relief contributed little, or possibly nothing, to the whole change of pauperism during this decade. This is not, as I have concluded,[28] because the anti-out-relief policy ceased to be efficient, but because it ceased, practically speaking, to advance.

[27] Figures for England only, of course—not the figures on which the plate is based.

Vide ante, pp. 265—268.

I think it may be well to summarise briefly at this point the argument that the decrease in pauperism during the decade 1871-81 was chiefly due *directly* to a change of administration resulting in further withholding of out-relief.

We know, to begin with, that in certain notorious cases, (Atcham, Brixworth, &c.), where an anti-out-relief policy has been initiated—quite from without and apart from any reference to change in industrial or other conditions of the union—that policy has resulted in a great reduction in the numbers of those relieved, not to mention that reduction of out-relief was the chief aim of the new poor law to the same end. These facts render it *probable à priori* that the relation between changes of out-relief and changes of pauperism, in any case where the two are found to accompany one another, is of the same character as in these well-known cases, or as I have called it a *direct* relation.

Now our tables show that invariably (in all the groups and in both decades) the greatest average reductions of pauperism accompanied the greatest average reductions of out-relief ratio. It is at least probable, as remarked above, that the relation between the two changes is direct. But the following facts seem absolutely to exclude any other interpretation :—

(1.) The reduction of out-relief ratio cannot be due to increasing density of population (as suggested by Mr. Booth[29]), for changes of population have been separately allowed for in the regression equations. Neither can it be due to changes in proportion of old for the same reason. So that changes in pauperism and out-relief ratio cannot be due to either of these as a common cause.

(2.) The reduction of in-door pauperism during the first decade was only very small compared with the reduction of total pauperism. But the changes in in-door relief follow the fluctuations of the marriage-rate, and so may be ascribed to general economic causes. Therefore the changes in out-relief ratio and in total pauperism cannot be so ascribed. Changes of administration and of total pauperism must be due to something other than economic changes.

(3.) It should also be noticed that the standard deviations of changes in out-relief ratio are very much greater in the second decade than in the first. This is exactly what might be expected if there was a general tendency to reform in the first decade, a tendency that gradually disappeared to leave behind it nothing but the chaos that still subsists.

Granted, for these reasons, that the relation between the reduction of out-relief and the reduction of pauperism was direct,

[29] *Loc. cit.* on p. 254, "Economic Journal," vol. vi, 1896, p. 74.

the mean reduction of out-relief is sufficient to account for more than half ($\frac{5}{8}$) of the change in pauperism in the earlier decade.

The idea that the *whole* change (in the earlier decade) is not entirely due to changed administration, is borne out by the fact that from 1871 to 1876 or thereabouts, the reduction of 40 per cent. in total pauperism was accompanied by a reduction of 15 per cent. in in-door pauperism; probably connoting an almost equal reduction in total pauperism not due to reduced out-relief. It is true that from 1876-80 there was again a rise in in-door relief, leaving a reduction on the whole of only some 2 per cent. from 1871-81, but it seems likely that this rise was a little abnormally large owing to the reduction of out-relief during the decade. Where the proportion of out-door relief is large, economic pressure will probably chiefly swell the numbers of out-door paupers; if it be greatly reduced (administratively) the pressure will *have* to be taken by the in-door numbers.

Unaccounted Changes.

The same process of averaging as that used above, applied to the unaccounted changes, gives—

		Per Cent.
Mean unaccounted change during 1871-81	$-$ 10·9
„ „ 1881-91	$-$ 11·7

Apparently during the whole twenty years there have been some almost steady factors (other than administration) at work, tending to reduce pauperism. What are these factors is a question that must be left for future discussion, but I hope further work may throw some light on the subject.[30]

Meanwhile it occurred to me that if these "unaccounted "changes" were due to changes in the general economic conditions of the country, they should correspond in sign to the changes in *in-door* pauperism in the different groups. This seemed probable at least from the curves shown on the plate. I confess, however, that even with that diagram, before me, the great differences, even in sign, between the actual changes in *total* pauperism and the unaccounted changes (*e.g.*, in metropolitan group, actual *decrease* 50 per cent.; unaccounted *increase*, 13 per cent.) gave me but little hope of my idea being verified. The actual results, as given below, surpassed my expectations: they afford a further con- firmation of the hypothesis that changes in *total* pauperism do not follow closely changes in economic or other non-administrative conditions :—

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[30] The great differences between the unaccounted fractions in the different groups in the different decades are the puzzling point.

TABLE H.

	Group.	Change in In-Door Pauperism.	Unaccounted Change.
1871–81	Rural............................	− 14	− 27
	Mixed	− 11	− 26
	Urban	0	− 4
	Metropolitan...............	+ 9	+ 13
1881–91	Rural............................	− 16	− 14
	Mixed	− 12	− 11
	Urban	− 13	− 17
	Metropolitan...............	+ 1	+ 1

The changes in in-door pauperism given are the changes of the percentage of the population in receipt of in-door relief, as these were easier to calculate than the unloaded means. Without any exception, save possibly the urban group in 1871-81, the sign of the unaccounted change is the same as the sign of the change in in-door pauperism. Moreover the magnitudes of the two changes correspond, closely in the second decade, roughly in the first. Thus the curious distribution of these unaccounted changes from rural to urban, and the differences between the two decades, are substantiated by the changes in in-door relief. Seeking for the causes of the one, we are seeking in all probability for the causes of the other. Knowledge of this may facilitate the search, for the change in in-door pauperism will give us a measure of the "unaccounted change," or change due to economic factors, for each *individual* union.

Regression Equations of Out-Relief Ratio.

It remains for us to discuss in the same way the manner in which, if at all, the out-relief ratio appears to have been affected by changes in proportion of old and in population. I have not included changes in pauperism in these equations. Of course, inasmuch as change in out-relief ratio helps to estimate change in pauperism, change in pauperism would help to estimate change in out-relief ratio — but it is difficult to imagine any causal relation between the two, such that pauperism should influence out-relief ratio.

The eight regression equations are all included in Table I below, the net or partial correlation coefficients of out-relief with changes in old and population being given in addition in the last two columns.

TABLE I.

Group and Period.	Change in Out-Relief Ratio is Equal to			Standard Deviation.		Per Cent. (1) on (2).	Partial Correlations.	
	Per Cent.	Times Change in Proportion of Old.	Times Change in Population.	(1) Round Mean.	(2) Round Regression Equation.		Out-Relief and Old.	Out-Relief and Population.
1871–81 { Rural	− 29·25	+ 0·362	− 0·021	25·2	25·0	99	+ 0·105	− 0·005
Mixed	− 32·81	+ 0·292	+ 0·282	24·6	24·4	99	+ 0·094	+ 0·134
Urban	− 38·63	+ 0·215	− 0·156	25·4	25·1	99	+ 0·061	− 0·091
Metropolitan	− 75·50	+ 0·312	+ 0·045	12·6	12·4	98	+ 0·189	+ 0·091
1881–91 { Rural	+ 19·54	− 0·646	− 0·346	43·2	43·0	99·5	− 0·099	− 0·047
Mixed	+ 5·95	− 0·082	+ 0·181	34·4	34·3	100	− 0·016	+ 0·052
Urban	+ 5·59	− 0·831	− 0·154	36·3	35·8	99	− 0·161	− 0·064
Metropolitan	− 38·34	+ 3·465	+ 0·200	41·7	36·1	87	+ 0·454	+ 0·126

It will be seen that all the correlation coefficients, with the exception of those of the metropolitan group, are very small. Moreover, in the case of out-relief and population the sign runs simply $+ - + -$ all the way down; there is no order in it at all. In the case of out-relief and proportion of old, all the coefficients are positive in the earlier decade, but negative in the first three groups of the later decade. Neither do the probable errors[31] of the regressions (so far as they are valid for these cases of non-normal correlation) give us any greater certainty of sign.

<p style="text-align:center">TABLE J.</p>

Regression Coefficient.	Probable Error.	Regression Coefficient.	Probable Error.
+ 0·362	0·151	− 0·021	0·184
+ 0·292	0·145	+ 0·282	0·098
+ 0·215	0·225	− 0·156	0·110
+ 0·312	0·193	+ 0·045	0·058
− 0·646	0·287	− 0·346	0·326
− 0·082	0·236	+ 0·181	0·164
− 0·831	0·336	− 0·154	0·158
+ 3·465	0·809	+ 0·200	0·187

The only conclusions that can be drawn are, I think, negative, viz., that out-relief does not appear to be largely or regularly affected either one way or the other by changes either in proportion of old or in population—or at all events by changes of such magnitude as occur within a single decade.

Summary of Conclusions.

Changes in rates of total pauperism always exhibit marked correlation with changes in out-relief ratio, but very little correlation with changes in population or in proportion of old in the different unions.

Changes in out-relief ratio exhibit no correlation one way or the other with changes of population or proportion of old.

It seems impossible to attribute the greater part, at all events, of the observed correlation between changes in pauperism and changes in out-relief ratio to anything but a direct influence of change of policy on change of pauperism, the change in policy not being due to any external causes such as growth of population or economic changes.

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[31] Karl Pearson and L. N. G. Filon, "On the Probable Errors of Frequency "Constants, &c."—"Phil. Trans. A," vol. cxci, 1898, pp. 229—311.

Assuming such a direct relation, it appears that some five-eighths of the decrease of pauperism during 1871-81 was due to changed policy. The decrease during 1881-91 cannot be so accounted for, policy having scarcely changed during that decade.[32]

In both decades there were considerable changes in pauperism not accounted for by changes in either out-relief ratio, population, or proportion of old. These unaccounted changes were decreases in the more rural groups, but increases in the metropolitan group in both decades. The unaccounted changes are the same in sign, and of the same order of magnitude as the changes in in-door pauperism, and so are probably due to social, economic, or moral factors.

I wish to say, in conclusion, that I do not consider this paper as in any way complete; I have purposely called it Part I. The large changes that have had to be left for the present as simply "unaccounted for," obviously demand further investigation. The chief difficulty of investigation lies in the lack of statistical measures of changes in single unions; I would be very glad of any suggestions on this head. The handling of the county as the unit instead of the union would be highly unsatisfactory in many ways. The results of the present memoir must thus, to a certain extent, be considered as only preliminary.

I hope in my next paper to complete the investigation on the present lines, by the treatment of the Welsh unions—which I fear must be taken as a single group—and then to proceed to the discussion (1) of the "unaccounted" changes; (2) of the economic correlations of changes in out-relief ratio.

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[32] This result is entirely in accord with the conclusions of Major Craigie, in his valuable paper already cited, on "The English Poor Rate" (*Journal of the Royal Statistical Society*, vol. li, 1888, p. 450), his arguments being practically the argument from the rates of in-door pauperism reproduced by me (pp. 265 and 266 and plate).

APPENDIX.

TABLE 1.—*Table of Means and Standard Deviations of Percentage Ratios.*

	Group.	Pauperism.		Out-Relief Ratio.		Proportion of Old.		Population.	
		Mean.	Standard Deviation.	Mean.	Standard Deviation.	Mean.	Standard Deviation.	Mean.	Standard Deviation.
1871–81	Rural	65·4	16·2	72·1	25·2	103·6	8·9	97·5	7·3
	Mixed	66·1	17·2	70·0	24·6	99·0	9·8	111·0	14·5
	Urban	74·0	25·3	64·4	25·4	98·5	7·9	121·5	16·2
	Metropolitan	50·3	16·2	25·2	12·6	99·2	9·0	120·0	29·8
1881–91	Rural	91·7	19·5	115·5	43·2	107·5	7·5	97·7	6·6
	Mixed	91·1	18·0	107·1	34·4	105 6	8·2	108·9	11·8
	Urban	85·8	20·9	98·0	36·3	105·9	7·5	117·5	15·9
	Metropolitan	104·7	29·2	90·6	41·7	107·7	5·5	111·3	23·8

TABLE 2.—*Table of the Correlation Coefficients (Gross) and of their Probable Errors.*

Correlation Coefficient between Changes in	1871-81.				1881-91.			
	Rural.	Mixed.	Urban.	Metropolitan.	Rural.	Mixed.	Urban.	Metropolitan.
Pauperism and out-relief ratio..............................	+0·484 ±0·034	+0·412 ±0·039	+0·575 ±0·044	+0·594 ±0·077	+0·528 ±0·032	+0·307 ±0·042	+0·558 ±0·045	+0·516 ±0·087
Pauperism and proportion of old	+0·194 ±0·042	+0·090 ±0·047	+0·053 ±0·066	+0·395 ±0·101	+0·053 ±0·044	+0·265 ±0·044	+0·207 ±0·063	+0·412 ±0·099
Pauperism and population...	−0·094 ±0·044	+0·038 ±0·047	−0·104 ±0·066	−0·593 ±0·078	−0·001 ±0·044	−0·218 ±0·045	−0·158 ±0·064	−0·135 ±0·117
Out-relief ratio and proportion of old...............	+0·131 ±0·043	+0·018 ±0·047	+0·111 ±0·066	+0·167 ±0·116	−0·087 ±0·044	−0·054 ±0·047	−0·148 ±0·064	+0·486 ±0·091
Out-relief ratio and population	−0·079 ±0·044	+0·097 ±0·047	−0·129 ±0·065	−0·012 ±0·119	+0·001 ±0·044	+0·073 ±0·047	−0·007 ±0·066	+0·230 ±0·113
Population and proportion of old	−0·575 ±0·029	−0·593 ±0·030	−0·431 ±0·054	−0·528 ±0·086	−0·479 ±0·034	−0·555 ±0·032	−0·352 ±0·058	+0·254 ±0·112

TABLE 3 (*Figures for Curves of Plate*).—*Pauperism, &c., 1st January Returns, England and Wales.*

1	2	3	4	5	6	7
	Pauperism. (Numbers Relieved on 1st January, per Cent. of the Population. Lunatics and Vagrants excluded.)			Out-Relief Ratio. (Ratio Numbers Out to Numbers In.)	Vagrants per Million of the Population, 1st January.	Marriage-Rate per Cent. of the Population in each Year.
Year.	In.	Out.	Total.			
1858...	0·657	4·10	4·76	6·25	125	16·0
'59....	0·590	3·67	4·26	6·23	111	17·0
1860....	0·545	3·54	4·08	6·49	78	17·1
'61....	0·616	3·69	4·31	6·00	98	16·3
'62....	0·660	3·86	4·52	5·85	141	16·1
'63....	0·660	4·75	5·41	7·21	208	16·8
'64....	0·623	4·09	4·71	6·57	152	17·2
'65....	0·616	3·85	4·47	6·26	160	17·5
'66....	0·604	3·56	4·16	5·89	211	17·5
'67....	0·627	3·65	4·28	5·83	235	16·5
'68....	0·684	3·89	4·57	5·69	283	16·1
'69....	0·693	3·84	4·53	5·54	320	15·9
1870....	0·694	3·96	4·65	5·71	244	16·1
'71....	0·680	3·91	4·59	5·75	166	16·7
'72....	0·617	3·45	4·07	5·60	148	17·4
'73....	0·595	3·03	3·62	5·09	131	17·6
'74....	0·576	2·74	3·32	4·77	132	17·0
'75....	0·582	2·63	3·21	4·51	94	16·7
'76....	0·556	2·33	2·89	4·20	137	16·5
'77....	0·580	2·18	2·76	3·76	171	15·7
'78....	0·611	2·16	2·77	3·54	207	15·2
'79....	0·637	2·32	2·96	3·65	186	14·4
1880....	0·682	2·38	3·06	3·49	233	14·9
'81....	0·672	2·21	2·88	3·29	242	15·1
'82....	0·659	2·15	2·81	3·27	221	15·5
'83....	0·658	2·12	2·78	3·23	173	15·5
'84....	0·639	2·01	2·65	3·15	184	15·1
'85....	0·642	2·01	2·65	3·13	181	14·5
'86....	0·652	2·06	2·71	3·16	204	14·2
'87....	0·652	2·06	2·71	3·16	183	14·4
'88....	0·659	2·05	2·71	3·12	210	14·4
'89....	0·642	1·98	2·62	3·08	251	15·0
1890....	0·625	1·89	2·51	3·02	200	15·5
'91....	0·611	1·32	2·43	2·98	193	15·6
'92....	0·602	1·73	2·33	2·87	240	15·4
'93....	0·621	1·75	2·37	2·82	243	14·7
'94....	0·658	1·80	2·46	2·74	319	15·1
'95 ...	0·661	1·78	2·44	2·70	338*	15·0
'96....	0·658	1·78	2·44	2·72	436*	15·8

* It is doubtful if these figures are comparable with the others, as some alteration was made in the method of counting.

FREQUENCY TABLES.

The following tables have been selected from those accompanying Mr. Yule's paper. Though the exigencies of space in the *Journal* do not allow the fulfilment of the desire of those who wished the tables printed *in extenso*, it is felt that the publication of a representative selection from them may bridge over the difficulty by at least illustrating the methods pursued by the author in compiling them.

For an example of reading the tables, take Table I, *column* headed 35—45. There were twelve unions of the rural group in 1871-81 in which the percentage ratio of pauperism lay between 35 and 45 per cent. (*i.e.*, the decrease lay between 55 and 65 per cent.). Of these twelve, in one case the out-relief ratio of 1881 lay between 15—25 per cent. of its value in 1871, in two cases between 35 and 45 per cent., in four cases between 45 and 55 per cent., in four again between 55 and 65 per cent., and in one case between 75 and 85 per cent. Similarly, taking the second *row*, there were seven unions in which the out-relief ratio of 1881 lay between 25 and 35 per cent. in 1871. Of these seven, the percentage ratio of pauperism lay between 15 and 25 per cent. in one (*i.e.*, the pauperism of 1881 lay between 15—25 per cent. of its value in 1871), between 25—35 per cent. in one, between 45—55 per cent. in four, and between 75—85 per cent. in one.

TABLE I.—*Pauperism and Out-Relief Ratio*, 1871-81. *Rural Group.*

Percentage Ratios of Out-Relief Ratio.	Percentage Ratios of Pauperism.											Totals.
	15—25.	25—35.	35—45.	45—55.	55—65.	65—75.	75—85.	85—95.	95—105.	105—115.	115—125.	
15— 25	—	—	1	—	—	—	—	—	—	—	—	1
25— 35	1	1	—	4	—	—	1	—	—	—	—	7
35— 45	—	3	2	10	3	3	—	—	—	—	—	21
45— 55	—	2	4	7	8	6	4	—	—	—	1	32
55— 65	—	—	4	10	11	11	8	—	—	—	—	44
65— 75	—	—	—	4	10	13	7	2	1	—	—	37
75— 85	—	—	1	7	12	8	1	7	1	—	—	37
85— 95	—	—	—	1	4	3	1	1	—	1	—	11
95—105	—	—	—	1	4	5	4	5	—	—	—	19
105—115	—	—	—	—	1	4	5	1	—	—	—	11
115—125	—	—	—	—	1	3	1	3	1	1	—	10
125—135	—	—	—	—	1	—	1	1	1	—	—	4
135—145	—	—	—	—	—	—	1	—	—	—	—	1
145—155	—	—	—	—	—	—	—	—	—	—	—	0
155—165	—	—	—	—	—	—	—	—	—	—	—	0
165—175	—	—	—	—	—	—	—	—	—	—	—	0
175—185	—	—	—	—	—	—	—	—	—	—	—	0
185—195	—	—	—	—	—	1	—	—	—	—	—	1
Totals	1	6	12	44	55	57	34	20	4	2	1	236

TABLE II.—*Pauperism and Proportion of Old, 1871-81.   Rural Group.*

Percentage Ratios of Proportion of Old.	Percentage Ratios of Pauperism.											Totals.
	15—25.	25—35.	35—45.	45—55.	55—65.	65—75.	75—85.	85—95.	95—105.	105—115.	115—125.	
70— 75	—	—	—	1	—	—	—	—	1	—	—	2
75— 80	—	—	—	—	—	—	1	—	—	—	—	1
80— 85	1	—	—	—	—	—	1	—	—	—	—	2
85— 90	—	1	—	1	—	—	1	1	1	—	—	5
90— 95	—	1	1	6	4	4	1	1	—	—	—	18
95—100	—	1	5	14	12	10	7	5	—	—	—	54
100—105	—	3	1	10	11	16	7	2	—	1	—	51
105—110	—	—	3	8	16	21	8	5	—	—	—	61
110—115	—	—	1	4	6	4	4	4	1	—	—	24
115—120	—	—	—	—	4	1	1	2	1	—	—	9
120—125	—	—	1	—	2	—	1	—	—	—	1	5
125—130	—	—	—	—	—	1	—	—	—	—	—	1
130—135	—	—	—	—	—	—	1	—	—	1	—	2
135—140	—	—	—	—	—	—	1	—	—	—	—	1
Totals	1	6	12	44	55	57	34	20	4	2	1	236

TABLE III.—*Pauperism and Population, 1871-81.   Rural Group.*

Percentage Ratios of Population.	Percentage Ratios of Pauperism.											Totals.
	15—25.	25—35.	35—45.	45—55.	55—65.	65—75.	75—85.	85—95.	95—105.	105—115.	115—125.	
80— 85	—	—	—	—	—	—	3	1	—	1	—	5
85— 90	—	—	1	—	2	3	7	2	—	—	—	15
90— 95	—	1	3	10	19	24	6	5	1	—	1	70
95—100	—	4	5	17	23	18	8	4	1	1	—	81
100—105	—	1	2	10	4	10	8	5	—	—	—	40
105—110	—	—	—	5	5	2	—	2	—	—	—	14
110—115	1	—	1	1	1	—	2	—	1	—	—	7
115—120	—	—	—	—	1	—	—	—	—	—	—	1
120—125	—	—	—	—	—	—	—	—	1	—	—	1
125—130	—	—	—	—	—	—	—	—	—	—	—	0
130—135	—	—	—	1	—	—	—	—	—	—	—	1
135—140	—	—	—	—	—	—	—	—	—	—	—	0
149—145	—	—	—	—	—	—	—	1	—	—	—	1
Totals	1	6	12	44	55	57	34	20	4	2	1	236

TABLE IV.—*Out-Relief Ratio and Proportion of Old, 1871-81.   Rural Group.*

Percentage Ratios of Proportion of Old.

Percentage Ratios of Out-relief Ratio.	70—75.	75—80.	80—85.	85—90.	90—95.	95—100.	100—105.	105—110.	110—115.	115—120.	120—125.	125—130.	130—135.	135—140.	Totals.
15— 25						1									1
25— 35			1		1		2	2						1	7
35— 45	1				3	7	7	2			1				21
45— 55				2	2	8	8	6	4	1	1				32
55— 65					6	11	11	11	5	2					44
65— 75	1	1	1	1	1	7	5	15	4	3	1	1			37
75— 85					2	12	5	8	4				1		37
85— 95				1	1		4	4	1	2	2		1		11
95—105				1	1	2	4	6	2						19
105—115						1	2	4	3	1					11
115—125				1	1	3	3	1	1						10
125—135						2		1	1						4
135—145								1							1
145—155															0
155—165															0
165—175															0
175—185															0
185—195								1							1
Totals	2	1	2	5	18	54	51	61	24	9	5	1	2	1	236

TABLE V.—*Out-Relief Ratio and Population, 1871-81.   Rural Group.*

Percentage Ratios of Population	Percentage Ratios of Out-Relief Ratio																		Totals
	15–25	25–35	35–45	45–55	55–65	65–75	75–85	85–95	95–105	105–115	115–125	125–135	135–145	145–155	155–165	165–175	175–185	185–195	
80— 85		1				1		1	1	1									5
85— 90	1			1	4	2	4			1	2								15
90— 95		1	2	11	10	15	11	5	8	3		3						1	70
95—100		3	11	12	16	12	10	5	6	3	2	1							81
100—105		1	6	5	6	4	7		3	3	4		1						40
105—110				3	4	2	3		1		1								14
110—115		1	1		3	1	1												7
115—120					1														1
120—125											1								1
125—130																			0
130—135			1																1
135—140																			0
140—145							1												1
Totals	1	7	21	32	44	37	37	11	19	11	10	4	1					1	236

TABLE VI.—*Population and Proportion of Old,* 1871-81. *Rural Group.*

Percentage Ratios of Population.	Percentage Ratios of Proportion of Old.														Totals.
	70—75.	75—80.	80—85.	85—90.	90—95.	95—100.	100—105.	105—110.	110—115.	115—120.	120—125.	125—130.	130—135.	135—140.	
80— 85	—	—	—	—	—	—	—	—	2	1	—	—	1	1	5
85— 90	—	—	—	—	1	1	2	4	4	—	1	1	1	—	15
90— 95	—	—	—	—	1	8	12	31	13	4	1	—	—	—	70
95—100	—	—	—	1	9	21	20	20	5	2	3	—	—	—	81
100—105	—	—	1	2	3	17	13	3	—	1	—	—	—	—	40
105—110	—	—	—	—	1	5	4	3	—	1	—	—	—	—	14
110—115	1	1	1	—	2	2	—	—	—	—	—	—	—	—	7
115—120	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
120—125	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
125—130	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
130—135	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
135—140	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0
140—145	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
Totals	2	1	2	5	18	54	51	61	24	9	5	1	2	1	236

Table XIX.—1871-81, *Metropolitan Group.*

Union.	Percentage Ratios of			
	Pauperism.	Out-Relief Ratio.	Proportion of Old.	Population.
1. Kensington	27	5	104	136
2. Paddington	47	12	115	111
3. Fulham	31	21	85	174
4. Chelsea	64	21	81	124
5. St. George's	46	18	113	96
6. Westminster	52	27	105	91
7. Marylebone	81	36	100	97
8. St. John, Hampstead	61	39	103	141
9. St. Pancras	61	35	101	107
10. Islington	59	35	101	132
11. Hackney	33	22	91	150
12. St. Giles'	76	30	103	85
13. Strand	64	27	97	81
14. Holborn	79	33	95	93
15. City	79	64	113	68
16. Shoreditch	52	21	108	100
17. Bethnal Green	46	19	102	106
18. Whitechapel	35	6	93	93
19. St. George's East	37	6	98	98
20. Stepney	34	10	87	101
21. Mile End	43	15	102	113
22. Poplar	37	20	102	135
23. St. Saviour's	52	22	100	111
24. St. Olave's	57	32	102	110
25. Lambeth	57	38	99	122
26. Wandsworth	23	18	91	168
27. Camberwell	30	14	83	168
28. Greenwich	55	37	94	131
29. Lewisham	41	24	100	142
30. Woolwich	76	20	119	110
31. Croydon	38	29	101	142
32. West Ham	38	49	86	203

DISCUSSION *on* MR. YULE'S PAPER.

THE following remarks from Professor A. W. Flux (who was unable to be present) were read by the Assistant Secretary :—

The paper interests me especially because it aims at meeting a defect to which I happened to allude at a debate on a previous paper of Mr. Yule's, to which I had the pleasure of listening some three years ago. In that paper certain changes in pauperism were studied, and I expressed regret that the method did not permit their association with their causes. The present extension of the method has achieved that desirable end—at any rate in part. I am too well aware of the mathematical and arithmetical difficulties which prevent the achievement of all Mr. Yule would desire in that respect, to wish to dwell on the limitations of the present solution. If it be not complete itself, it is a great advance on no solution at all.

The point which most attracts me in the paper is, however, one where I hardly feel able to agree with the writer. It is illustrated in the plate of four curves attached to the paper, and referred to on p. 266. Mr. Yule says : " Therefore this greatest change must have been effected by some factors other than the economic ; administration seems the only alternative." It is with the penultimate word of the last phrase that I find it difficult to agree, and the diagram is precisely what suggests that it *may* not be a result of administrative change. May it not be suggested that a growing degree of prudence or foresight might both reduce pauperism and the marriage-rate (the former perhaps, as seen, earlier than the latter) ? If the improvement in this respect were not continuously progressive, the practical exhaustion of its effect would leave both pauperism and the marriage-rate to fluctuate about lower means than those which had been disturbed by the change referred to. I hesitate to assign a cause, though the study of marriage-rates by Mr. Hooker, to which reference is made in the paper, seems to establish the existence of a disposition to exercise greater prudence in incurring the responsibilities of matrimony in the later seventies. This prudence might be stimulated by more careful administration of the poor law ; but it may well be quite independent of it. The common indication of the pauperism and marriage-rate curves in their main outlines overriding the inverse relation of the ripples, as Mr. Yule himself notes, is a specially interesting point raised.

Mr. Yule invites suggestions of indices of the social factors in the problem. Might one suggest that an index connected with the marriage-rate, say, perhaps, the percentage of the population between 15 and 25 in each union who were married, is worth trying. The marriage-rates themselves would be useless for unions, but such a figure from the census returns might give

suggestive results. Perhaps, too, proportions of sex may be of as much importance as proportions of aged in the population.

Though I hesitate, without closer study of the details, to differ from the conclusion of the author of the paper as to the very great importance of administrative changes, a conclusion I would gladly accept, the results shown in Table E, even with the confirmation afforded by Table F, do not appear sufficiently concordant to carry unhesitating conviction. It may be that the linear relation employed is not that really representing closely the actual connection between the variables in question. Perhaps the smallness of the metropolitan and urban groups may affect their position in the table.

Mr. Yule has explained very skilfully the difficult features of the indices he obtains. The further light he promises at a future time may remove many of the stumbling-blocks which remain.

Professor F. Y. EDGEWORTH said he had great pleasure in expressing his gratitude to Mr. Yule for the ingenious method which he had adopted. To give one illustration of the practical applicability of Mr. Yule's conclusions, he had seen in an influential publication a statement of the great increase of pauperism in Ireland, from which it was inferred there had been a corresponding diminution in economical validity; but if the writers had these considerations before them, they would have thought it necessary, at all events, to inquire whether there might not have been changes in administration which would have accounted for a large proportion of the increase in pauperism. Mr. Yule's success was the more encouraging, because the case was not particularly favourable for the applications of the method. He did not know that the statistics which Mr. Yule had collected with such labour complied with what might be called the normal law. Certainly those which Mr. Yule had adduced in his former paper were far from normal. They did not fulfil the law of error. Perhaps he went a little further than Mr. Yule in the importance which he attached to normality, but to him it appeared that if one diverged much from that rule, one was on an ocean without rudder or compass. This law of error was more universal perhaps than the law of gravity, and as Mr. Yule came to apply his methods to moral and social phenomena, it would probably be found that, even with regard to these, the law of error prevailed. It tended to prevail, in fact, wherever there were numerous independent agencies at work. The statistics under examination may have fulfilled the law sufficiently well. But there were other phenomena to which the law would apply better, as, for instance, certain birth-rates and death-rates, and many other subjects to which he trusted Mr. Yule, in the course of time, would devote his attention. He might perhaps ask Mr. Yule if he could communicate his impression as to the degree in which the law was fulfilled. He might also ask if Mr. Yule could throw any light on the connection between pauperism and the distribution of age, which he dismissed in his summary, but which in some cases, as, for instance, in the Metropolitan area, appeared not to be negligible.

Mr. N. A. HUMPHREYS said he should like to add his tribute of admiration for the great ingenuity and ability the writer of the paper had shown in dealing mathematically with one of the most complex of statistical questions. The author had admitted to some disappointment at the extent of the positive results he had attained, but he deserved the thanks of statisticians for having brought to bear on the subject a mathematical method which in the main corroborated the conclusions which had been formed by more general observers who did not approach it from the same point of view. Of course the main feature in the pauperism statistics of the last twenty years was the marked decline of general pauperism which occurred concurrently with a marked decrease in the proportion of out-door relief. The writer drew the conclusion that about five-eighths of the decline in pauperism might be attributed directly to what he called "changed administration," by which term he mainly meant the reduction of out-door relief. What, from a general point of view, it was most important to know was the real cause of that reduction. They were startled with the fact that out-door relief was reduced to this enormous extent at a time when the proportion of in-door paupers remained constant. Was this reduction of out-door relief due to the rejection of applications unwarranted by real destitution, or was it due to deeply-rooted dread of the workhouse, which prevented application for relief in cases of real destitution? He thought that practical statisticians should endeavour to furnish improved statistical material to the mathematicians who were coming to their help by bringing more scientific methods to bear on statistical problems. He had always been struck with the paucity of the facts given in the Local Government Board statistics of pauperism. More detailed information respecting the ages of paupers in receipt of in-door and out-door relief in successive years, and of the physical condition of the inmates of workhouse institutions were urgently needed, as the workhouse was practically the hospital for chronic illness among the aged poor. If that information were regularly published for all the unions, it would supply a basis of facts which would throw infinite light on the question under discussion, and would help Mr. Yule and other mathematicians the better to arrive at the real causes of the fluctuations in pauperism.

Mr. E. W. BRABROOK said he had very little to add to what had been so pregnantly said by Professor Edgeworth and Mr. Humphreys, but he wished to express his sense of the gratitude they owed to those who applied the doctrines of mathematical analysis with so much ability and success to the search for the real inwardness of practical questions like this. In regard to the subject of the paper itself, he said that medical relief, which Mr. Yule included in his statistics of pauperism, stood on a different footing to other modes of relief. With regard to Table B, which showed the numbers of changes which produced a change in pauperism, he observed that if one worked them out roughly for the period between 1871 and 1881, there were three

and a half times as many changes in population as in the later
period. He did not know before that it was the case. Turning
to Tables E and F, the discontinuance of out-door relief, which
had only taken place in one or two of the large unions of London,
could hardly account for so large a change as $56\frac{1}{2}$ per cent. in the
relief ratio of the metropolitan district. Might there not possibly
be some explanation of this very high figure which would be more
consistent with the actual facts? In the diagram at the end he
observed that the scales were different. For instance, Scale C, 14,
16, or 18 per 1,000 were only allowed 1 square, whilst Scales B and
D were allowed 2 squares, and Scale A only $\frac{1}{5}$ of a square for
each per 1,000. That seemed to rather distort the proportion
between the various curves, and one might imagine that the
similarity which was shown in these curves might not be so
direct if they were all on a similar scale.

Mr. W. F. Sheppard drew attention to the omission[1] of the
tables which originally accompanied the paper. There were three
reasons why he was sorry these tables had not been printed. In
the first place, it was very difficult to test Mr. Yule's conclusions,
or even to follow the paper very closely, without having
the tables at hand for constant reference. In the second place,
he thought more attention ought to be given, generally, to
the tabulation of statistics. The different stages of statistical
reasoning ought to be kept separate. There was first the collection
of the data; then their tabulation; then the development of
mathematical methods of treating properly formed tables; and
then the application of these methods to the particular case—this
latter process being usually a branch of economics rather than of
statistics. Of these four stages, the one which required most
attention at the present time was the second. The tabulation of
statistics was so often defective or inaccurate, that the development
of accurate methods of treatment was retarded by want of sufficient
material to work on. Finally, the main point about the present
paper was that it was an example of the application of, practically,
a new method. But the omission of the tables deprived the paper
almost entirely of its value in this respect, because without them
it was very difficult for the ordinary student to adopt the same
method with regard to other statistics.

In looking at Mr. Yule's tables, he was struck by the large
variations in the out-relief ratio. Thus in 1891 the different
values of this ratio ranged from (perhaps) 15 per cent. to 145 per
cent. of the values for the same unions in 1881. This raised the
question whether the method of tabulation adopted was the best
possible. The variability in ten years being given by the table,
how could we deduce the variability in five years? It would not
do to halve all the variations, because on this principle the varia-
bility in twenty years would show in several cases a change from

a positive to a negative ratio, which of course was meaningless. What was wanted, was to find a scale of measurement such that equal increments of the measure should be of practically equal value at all points of the scale. Under the percentage tabulation this was not the case; thus it would take a certain effort to reduce the pauperism by 50 per cent. in ten years, but it would require an infinitely greater effort to get rid of the remaining 50 per cent. in another ten years. This inequality at different points of the scale appeared to be the real reason why the "law of error" did not apply. Perhaps a logarithmic tabulation might prove to be better; if, for example, the out-relief ratio were reduced by 50 per cent. in ten years, then the continuance of the same system might possibly be found to reduce it by another 25 per cent. in the next ten years. Some light might be thrown on this by forming a correlation table of the alterations of out-relief ratio between 1871 and 1881 and the alterations between 1881 and 1891. Mr. Yule could perhaps say whether such a correlation existed; *i.e.*, whether the unions in which the out-relief ratio diminished (or increased) during the first decade were on the whole the same as the unions in which it diminished (or increased) during the second decade.

Mr. R. H. HOOKER supported Mr. Sheppard's plea for the printing of the tables.

Mr. JESSE ARGYLE said it was interesting to note that the results brought out in the paper, for the decade 1881-91, agreed very much with those adduced by the ordinary methods of statistics. It might be remembered that Mr. Booth and others had gone into this question very largely, and Mr. Booth's conclusion, after fully examining the figures for the decade in question, was that no one factor nor any combination of factors could be found which seemed satisfactorily to account for the changes that had taken place in the various unions, and that policy of administration had least of all been attended with traceable effects. Referring to the period of 1871-81, it was very desirable to see whether there were not other important factors besides the one of administrative policy which had brought about the change. If he remembered rightly, that decade was one of great industrial expansion; and of the growth of thrift agencies of all kinds, when the great friendly societies made enormous strides, and he thought it would be found that while administration had a great deal to do with the change, yet it was assisted to a very large extent by thrift and other agencies which were quite apart from the action of the poor law.

The CHAIRMAN (Sir ROBERT GIFFEN, K.C.B.) said it was now his duty to ask the Members to pass a vote of thanks to Mr. Yule for his paper. They were all much obliged to a gentleman of his mathematical attainments for bringing his powers to bear on some of the questions which many of them were accustomed to discuss without much use of that science. It was very interesting to see mathematicians so much interested in the handling of statistical

material, and he should hope in the course of time that a great many valuable results might be obtained by that means. It would be very desirable if this cold light of science could be brought to bear on the discussion of a great many subjects which excited passion in the public mind, and caused contradictory and violent statements of the most remarkable character. The present paper was an effort in that direction. It was a genuine scientific attempt to bring out the facts as to the increase or decrease of pauperism and the causes of it in different parts of England. He might offer some observations of a general kind, though he could not pretend to discuss the mathematical methods. Most of those who had devoted consideration to the question of pauperism, would be glad to see that the results brought out confirmed in a general way the impression regarding it, viz., that the administrative action of the Local Government Board and the poor law authorities counted for something in the reduction of pauperism in the last thirty years. He did not think however that this was a question which would ever be decided altogether by statistics. It was a question largely for experts in the administration of poor relief. Those connected with poor law administration had been able to notice in a great many cases that, if the strings were drawn tightly in the matter of out-door relief, they could immediately observe a reduction of pauperism itself. That was a thing which they got to know from their daily observation, and which they were quite certain would be confirmed, as it was always confirmed, by a careful examination of the statistics themselves. But it was not fair to say that they were dependent for their information exclusively on the statistics, because they got it before the statistics, and the statistics were largely useful to them as enabling them to see what had been done over a more extended field than that within their own observation. None the less, the work of Mr. Yule was useful to those who were practical students of the subject, and who had not an equipment of mathematics. He should doubt extremely whether any application of the mathematical method would enable one to say that when a given effect of an economical kind was produced in the community, it was possible to affirm that so much of that effect was due to one cause and so much to another. He had observed, at any rate, in the discussion of an analogous question—the question of the fall of prices—that a good many people had set themselves to say whether that decrease or fall of prices was due to something in money or something affecting goods, and they wished to discuss how much was due to one cause and how much to the other. He thought that those who were accustomed to the complexity of economic causes and effects must recognise that that was hardly the right way to go to work. The same might be said with regard to this question as to the effect of administration and the effect of the improvement of the community economically, and of the effect of the improvement of the community morally in reducing pauperism. Mr. Yule had attacked, and was still further going to attack, the problem a little from that point of view, and the point he should put would be that the practical case he might have to consider was not that of an effect which was partly due to one cause and partly

due to another, but an effect where all these causes were perhaps more in the nature of conditions *sine quâ non*. If you had not had all those conditions in existence beforehand, perhaps you would not have had the effect at all. That applied, it seemed to him, to the question of the effect of an administrative change with regard to out-relief in reducing pauperism. It might be, and no doubt was, the case that the restriction of out-door relief had contributed to the reduction of pauperism, but then it had contributed in a society where certain conditions already existed, those conditions being at the present time a constant improvement in the economic and moral conditions of the community. If one had had the restriction of out-door relief in a totally different set of circumstances, it did not follow that the restriction would have had the same success, or anything like it. It must always be kept in mind in dealing with these matters that causes of a particular effect might be concurrent, but might not be exactly on the same plane, and that there was really no opportunity of considering how much might be due to one cause or how much might be due to another. It seemed to him that not merely on the point Mr. Humphreys specially referred to, but on other points the Local Government Board's statistics might be capable of considerable improvement. There should be, for instance, some attempt made not merely to give the numbers of paupers, but to have some statement as to the length of time during the year for which a person was a pauper. It might be found that there were two kinds of pauperism to be dealt with : the pauperism which was more or less chronic, where the people were receiving relief from year's end to year's end, and on the other hand a pauperism which was more or less transient, where people received relief for short periods. A record should also be kept as to all the persons receiving relief in a given year, whether at any other time of their lives they had received relief. They ought to have a regular and continuous record showing the extent to which pauperism existed in a given year, and how much each person who received relief had received. The return which showed the number of people actually relieved within the year as distinguished from the number in receipt of relief on a given date did not give the particulars he sought. At any rate he joined with Mr. Humphreys in the call for some improvement in the statistics of pauperism issued by the Local Government Board.

Mr. YULE, in reply, said he would like to pursue further the most interesting suggestion of Mr. Flux, that possibly a change in prudence had brought about both a fall in the marriage-rate and a fall in the rate of pauperism during the period 1871 to 1881. But why should not such a sudden change in prudence, if it had occurred, have brought about a fall in the in-door as well as the out-door rate ? As regards Professor Edgeworth's question, the law of error certainly did not hold in most cases for the reason pointed out by Mr. Sheppard, that the percentage changes were very large and came down practically to the physical limit of zero per cent. In one or two cases he had calculated the lines of means, and found them though perhaps not truly linear yet not widely

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different, and so erratic, that a straight line would fit them about as well as anything else. The greatest divergences occurred at the extremes of the tables where there were only a few units. Mr. Sheppard's suggestion that the changes in out-relief ratio during the two decades should be correlated to test for continuity of policy, was a most interesting one and he hoped to be able to follow it up. He was aware that the paper in general only bore out conclusions which had been reached before, and indeed he had quoted Major Craigie's paper, but he did not think that lessened the interest of getting an independent test of the theories of practical men purely from statistics. It was an absolutely unbiassed test, and it was always an advantage in a method that it was unbiassed. It must also be remembered that practical men were by no means so concordant in their views as the remarks of some of the speakers would lead one to suppose. He had included medical relief. It differed in some ways from other relief, but at the same time so much of relief always had been of a medical character—especially in the case of the aged—that he hardly liked to exclude it altogether. It did not seem to be of such a totally different character and did not come under such different administrative measures as lunacy and vagrancy relief. As regarded the suggestion that the $56\frac{1}{2}$ per cent. reduction in pauperism, attributed to the reduction of out-relief in London during 1871-81, was absurdly large, he did not agree, for the reduction in out-relief took place without exception in every union and in most unions to a very large extent indeed during that period.[2] He had mentioned in the paper, when referring to the plate, that the scales of the curves were all different. If they had been all on the same scale some of the curves would have gone off the paper altogether, whilst in others the fluctuations would have been inappreciable, e.g., the curve of in-door pauperism would have looked almost a straight line. He was glad two speakers[3] at least had sympathised with his desire to have the tables printed, and Professor Edgeworth's criticism bore on the same point. If the tables had been present the answers to his questions would have been obvious. If anyone wanted to check the constants given, or investigate an apparent error or misprint, it was necessary to see the tables. Their omission was certainly a great inconvenience. The effect of industrial expansion and the progress of friendly societies, referred to by Mr. Argyle upon the changes in pauperism during 1871-81, was allowed for in the paper in the unaccounted fractions. Taking the estimate of five-eighths due to change of administration, that left three-eighths due to other causes, and that was a very large proportion of the whole change. With regard to the Chairman's remarks about splitting up an effect into portions due to several causes, he differed from him in some points. It should be noticed that when he spoke of this splitting up, the amounts due to different causes were not fractional but algebraic parts of the whole change. In some cases the change he ascribed to a change in out-relief was greater than the whole change that had taken place, but against that there would

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[2] Vide the table now printed on p. 286.
[3] See note on p. 290.

be something to set off due to some other cause, which had brought
about a change in the opposite direction. The Chairman suggested
that during the period in which this great restriction in out-door
relief took place there was also a great improvement in the moral
character and industrial condition of the community, and so forth,
and that the rate of pauperism would not have fallen so much if
it had taken place under opposite conditions. He should have
preferred to deal with these two things separately. The restriction
on out-door relief was only one cause, and the other changes in
environment had their effects separately. If the change in out-
door relief had not occurred, one could have got out the change in
pauperism due to changes in industrial conditions and moral
character : if these latter had not occurred, one would have got
the change due to change in out-relief ratio : both having occurred,
the total change would be the *algebraical* sum of the two. The
change due to either factor separately need not be a fractional part
of the whole change. He quite agreed it was a most difficult
point to deal with in statistics, although at the same time he
thought that this method could deal with such cases, provided one
took into account all the important changes in the medium or
environment. Of course the difficulty was that one might leave
out some of those important changes. One could only deal
practically (on account of the bulk of arithmetic) with some three
or four changes, and in that way leave out changes in important
factors. This might lead to fallacies.

The STATISTICAL ASPECT *of the* SUGAR QUESTION.
By GEORGE MARTINEAU.

[Read before the Royal Statistical Society, 18th April, 1899.
RICHARD B. MARTIN, Esq., M.P. (Hon. Treasurer), in the Chair.]

CONTENTS :

Introduction.

THE origin of " the sugar question," the statistical aspect of which I am asked to illustrate, was, in the first place, the bounty on the exportation of French and Dutch refined sugar ; and, secondly, the great increase in the production of beetroot sugar, both raw and refined, on the continent of Europe, stimulated, as it is alleged, by bounties. The first is to a certain extent ancient history, and therefore I will to-day confine myself to the second, which is the burning sugar question at the present time.

In order to appreciate its statistical aspect, we must first, and in fact mainly, glance at the details of this vast European production of sugar, and try to come to some definite conclusion as to the influences which have led to its present remarkable development. That the rise and progress of the beetroot industry has been very striking is at once manifest when you compare the sugar production of the world at intervals during the last quarter of a century.[1]

[1] It is only the *visible* production of cane sugar that is taken into commercial statistics ; that is, either the accurately ascertained production of a country or its exports. The exports from British India, for instance, are included but not the production, which is vast, indefinite and unseen by the outside world. For these reasons it is disregarded, and also because the world's supply and price are at present unaffected by it, beyond the small yearly export of Madras sugar which remains tolerably uniform in amount.

	Visible Production of Cane Sugar.	Production of Beetroot Sugar.	Total.
	Tons.	Tons.	Tons.
1872....................	1,850,000	1,143,000	2,993,000
'82....................	2,116,000	1,783,000	3,899,000
'92....................	2,784,000	3,501,000	6,285,000
'97....................	2,310,000	4,916,000	7,226,000

In the first decade the cane sugar production was increased by 266,000 tons, and the beetroot production by 640,000 tons. In the second, cane went up 668,000 tons, and beetroot 1,718,000 tons. In the last five years, up to 1897, cane has decreased 474,000 tons, and beet increased 1,415,000 tons. This decrease in cane is accidental, being due to the Cuban insurrection. But, apart from this accident, it is clear that the world has now become dependent on the European beetroot crop for nearly two-thirds of its total visible supply of sugar, and that the supply of sugar and its price are therefore largely governed now by the vicissitudes to which that crop may be subject.

I.—*Production of Beetroot Sugar.*

1. *France and Germany : a Contrast.*

Turning to the details of the beetroot industry, let us look first at the yearly production of France and Germany from the season of 1871-72 to that of 1884-85.

Season.	French Production.	German Production.
	Tons.	Tons.
1871–72	287,444	186,442
'72–73	350,271	262,551
'73–74	339,925	291,040
'74–75	386,467	256,412
'75–76	396,222	358,048
'76–77	208,539	289,422
'77–78	341,256	378,009
'78–79	370,831	426,155
'79–80	238,210	409,415
'80–81	283,602	555,915
'81–82	307,088	599,722
'82–83	362,737	881,995
'83–84	406,007	940,109
'84–85	272,962	1,123,030

Here we are at once struck with the fact that in France, originally the foremost of all the European sugar producing countries, while in 1871-72 her production was 287,000 tons, 100,000 tons more than the German production, in 1884-85 it was no more than 272,000 tons. It had never risen during that period

of fourteen years above 406,000 tons, and the average for the fourteen years was only 325,000 tons.

In Germany, on the other hand, we find that the production, which in 1871-72 was only 186,000 tons, had risen in the fourteen years to 1,123,000 tons in 1884-85, and that the average production for that period was 497,000 tons.

How is it that, starting at a point considerably behind France, Germany should have so completely distanced her in fourteen years? If we look at the legislation of the two countries we find, I venture to think, a sufficient explanation.

In France, up to 1884, the beetroot factories were subjected to the strictest excise supervision, so that not an ounce of sugar was allowed to escape. The duty was levied on the sugar as it passed into home consumption; no drawback was therefore necessary on exportation, and there was no opportunity for a bounty.

In Germany the system was exactly the reverse. The duty was levied on the weight of the roots, according to an estimated yield of sugar; and as the quantity of sugar actually produced exceeded the quantity on which the duty was levied, a portion of the production escaped the tax. This system was deliberately adopted in order to stimulate improvements in cultivation and manufacture, and it thoroughly answered its purpose. Roots which at one time yielded only 5 or 6 per cent. of sugar were gradually improved by careful selection until, as time went on, they yielded 8, 9, then 10, 11, and finally at the present day 12 to 13 per cent. At the same time the processes of manufacture were brought nearer to perfection, so that now almost all the sugar contained in the roots is successfully extracted.

The producer thus responded heartily to the stimulus of the fiscal system, and he reaped his reward. As the full duty was returned in drawback on the sugar exported he had no fear of overloading his home market, and therefore went on increasing his cultivation and the size of his factory without hesitation, the profits of the constantly increasing bounty keeping him well supplied with capital for the necessary outlay.

I give the figures of the yield of sugar, per 100 of roots, in Germany year by year from 1871-72 to 1884-85. It is sufficient to compare the yield in France towards the close of the period. Germany at the beginning of the period had already been many years under the system of duty on the roots, and therefore her yield, even so far back as 1871-72, is better than that of France in 1884-85.

The German yield went up from 8·28 per cent. in 1871-72 to 11·02 per cent. in 1884-85, while the French yield remained below 6 per cent.

	Yield of Sugar in Germany.	Yield of Sugar in France.
	Per cnt.	Per cnt.
1871–72	8·28	—
’72–73	8·25	—
’73–74	8·25	—
’74–75	9·30	—
’75–76	8·60	—
’76–77	8·19	—
’77–78	9·29	—
’78–79	9·30	—
’79–80	8·64	—
’80–81	8·89	—
’81–82	9·69	5·10
’82–83	9·65	5·03
’83–84	10·77	5·55
’84–85	11·02	5·99

Thus we see a striking contrast. France, with no bounty, made little progress in cultivation and manufacture. Her roots remained poor, her methods more or less behind the times, and her production almost at a standstill. Germany, in 1884-85, had nearly doubled the French yield, and in fourteen years had multiplied her own production by six.

As we continue the history of these two countries from the point now reached, 1884, to the present time, we again find the figures faithfully indicating the fluctuations in legislation.

It was in 1884 that the German producer began to feel the inevitable effect of his over production on the world's price of sugar. In that year the price went down to the lowest point ever known, and then fell to half that price. You will see the result— a reduction in the German production from 1,123,030 tons in 1884-85, to 838,104 tons in 1885-86, which, I may mention incidentally, sent up prices from 10s. 3d. to 16s. 9d. per cwt.

In this same year, 1884, France took a new departure. There had been a serious crisis in the sugar trade, owing to the over-loaded stocks and the consequent great fall in price, and it became evident that the French beetroot sugar industry could no longer compete if it remained under a *régime* which secured every franc for the revenue and left nothing for the producer. By the French law of 1884, therefore, the German system was established in France, and the French producer at last enjoyed a bounty. The incidence of the duty was transferred from the actual sugar to the roots. All the pains that had been taken, by the strictest excise supervision, to ascertain the exact quantity of sugar produced, though still continued, were made of no effect, in order that the producer might have the same stimulus that had led to such successful results in Germany. Though the sugar produced

continued to be accurately noted, he was no longer charged with
duty on the actual quantity, but on a fictitious figure, known to
be much less than the real production. He received what was
equivalent to a drawback on exportation to the amount of the full
duty, so that he was always able to reduce his supply for the home
market to the requirements of the French consumption, and thus
to obtain the full duty on the whole of his production. He was
not only presented with a large bounty, but stimulated to make it
larger every year. The French yield was, as you have seen, very
small when this change was made, in 1884, and consequently the
estimated yield on which to levy the duty was fixed at a consider-
ably lower figure than that in force in Germany at the same
period. It took some years, of course, for the French producers
materially to increase the yield of their roots and the efficiency of
their machinery, but, as you will see by the figures, the improve-
ment gradually came.

A comparison of the production in France and Germany during
the period of the newly created French bounty, with the yield in
the two countries, gives a very different picture to that of the
previous table. France jumps at once from an average yield of
$5\frac{1}{2}$ per cent. to 7·83 per cent., and steadily increases up to 11·40
per cent., while her production rises from 265,000 to 700,000 tons.

Season.	French Production.	German Production.	French Yield.	German Yield.
	Tons.	Tons.	Per cnt.	Per cnt.
1885–86	265,071	838,104	7·83	11·43
’86–87	434,043	1,018,281	8·86	11·87
’87–88	347,785	958,863	9·53	13·08
’88–89	414,869	990,891	9·77	11·96
’89–90	700,409	1,261,353	10·47	12·36
’90–91	615,958	1,336,221	9·46	12·09
’91–92	579,420	1,198,025	10·26	12·06
’92–93	523,366	1,230,834	9·56	11·94
’93–94	514,788	1,366,001	9·80	12·34
’94–95	704,454	1,827,973	9·87	12·15
’95–96	593,646	1,637,057	10·97	13·11
’96–97	668,516	1,821,223	9·98	12·66
’97–98	730,067	1,844,399	11·40	12·79

Even in 1889-90 the French had increased their production, in
spite of a much lower range of prices than those which ruled
prior to 1884, to 700,000 tons. This was a good increase, and
would no doubt have been maintained had not the government
found that they were losing too much revenue by the enormous
bounty they had created. Changes were made in 1887 and 1890,
which compelled the manufacturers to increase their yield if they
were to maintain the amount of their bounty. The legal yield
was raised, and the excess yield, instead of being admitted free,

was charged with a portion of the duty.   At that time they had not succeeded in overtaking the German yield, but they made fresh efforts, with such success that at the present moment there is not much more than 1 per cent. difference between the yield in the two countries.   This again increased the bounty, and the result is again faithfully reflected in the figures.

The German Government, in the meantime, had come to the conclusion that their producers had arrived so nearly at perfection that no further stimulus was necessary.   While France had given up the accurate levying of the duty in order to give a bounty by the German system, the German Government, in 1888, proceeded to take the opposite course, and gradually to abolish the bounty by establishing excise supervision and levying the duty on the actual sugar.   But though they completely abolished the indirect bounty in 1892, they did not allow the vast sugar industry they had helped to create to suffer from the competition of the new French bounty or of the bounties in other countries.   A direct bounty was therefore substituted for the indirect one, but with the distinct announcement that it was only to remain in force until a general agreement for the abolition of bounties should be arrived at.

This direct bounty was to have been gradually reduced, but in the meantime the French production, as I have described, was making such progress that the German Government decided, in 1896, to double their direct bounty instead of reducing it.   They saw that France, with its new bounty, meant to fight hard for supremacy, and they openly declared this double bounty to be " a war bounty."   France lost no time in responding, and, in 1897, added to its enormous indirect bounty a direct bounty equivalent to the doubled bounty in Germany.

The debate in the French Chamber on this new law was very interesting, and the Government had some difficulty in carrying their point.   They defended this large addition to an already overgrown bounty by urging that Germany evidently intended to crush her adversaries ; that it had become " a war of legislation, " an act of deliberate economic aggression against French and " Austrian industry."   The proposed law was declared to be " necessary as a war measure, but only as a temporary one ; a law " of transition, of defence ; an arm for negotiating the abolition " of bounties."

The effect of this additional bounty was, on the one hand, to relieve the French market of its overloaded stocks ; but, on the other, to stimulate an increased production, which amounted in 1897-98 to 730,000, and is estimated for 1898-99 at 750,000 tons.[2]

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[2] French official statistics of sugar are reduced to pure sugar, that is, they are in round numbers about 10 per cent. lower than if expressed in raw sugar

I have given in some detail this brief history of the various phases of the German and French production and bounties, because I venture to think that it is instructive, and because the effects of the changes are so clearly reflected in the figures.

The exact amount of the French indirect bounty can be stated, because the excise supervision, though no longer required for the assessment of duty, was retained for the special purpose of ascertaining the annual amount of the bounty. This was necessary, because the law of 1884, which established the bounty, provided that the sugar-producing French colonies should receive each year the same bounty on the sugar they sent to France as the beetroot producers had secured in the previous season. Thus, if it was found that in one season the beetroot producers had succeeded in getting 20 per cent. of their production assessed at the reduced duty, then the French colonies were to be allowed, in the following year, to introduce into France a similar proportion of their imports at the reduced duty.

The official statement of the French indirect bounty for 1897-98 is as follows :—

"The net excess yield at the reduced duty represents for the "past season, 1897-98, 28·002 per cent. of the production, against "21·61 per cent. in 1896-97. The colonial allowance will therefore "be 28·002 per cent., against 21·61 per cent. The yield of the "beetroot comes out at 11·40 per cent. in refined, including the "sugar in the molasses, against 9·88 per cent. in 1896-97."

The official figures of this bounty, in francs, for each year since its creation in 1884, are as follows :—

Official Statement of the Amount of the French Indirect Bounty from 1884-85 to 1896-97.

[Report of the Senate Commission, 17th March, 1897, p. 79.]

	frs.		frs.
1884–85	25,364,177	1890–91	44,025,252
'85–86	45,448,944	'91–92	46,661,271
'86–87	91,966,437	'92–93	38,019,319
'87–88	68,438,704	'93–94	38,819,724
'88–89	56,744,468	'94–95	51,222,651
'89–90	90,977,833	'95–96	54,138,301
		'96–97	57,577,968

The effect of the changes in the law in 1887 and 1890 is clearly indicated. In both instances the bounty had risen to 90 millions, and fell immediately to 68 and 44 millions.

quantities. It is better to bear this in mind when comparing them with those of other countries, than to reduce them back again to a hypothetical raw sugar basis.

I cannot give the total indirect bounty for 1897-98, not having yet seen the figures for the colonial sugar. But the total indirect bounty on the beetroot production alone is 61,320,594 frs., calculated as follows: (1897-98) total production, 730,007,082 kilos.; excess yield at reduced duty, 204,414,374 kilos.

$$\frac{204,414,374 \times 100}{730,007,082} = 28 \cdot 002 \text{ excess yield per cent. of total}$$

production.

The duty is 60 frs. per 100 kilos., and the duty on the excess yield is only 30 frs. The gain on the excess yield is therefore 30 frs. per 100 kilos.

$$\frac{28 \times 30 \text{ frs.}}{100} = 8 \cdot 40 \text{ frs. bounty per 100 kilos. of sugar produced.}$$

7,300,070·82 × 8·40 frs. = 61,320,594 frs., indirect bounty on the crop of 1897-98.

The bounty per 100 kilos. of the excess yields, the excess yields per cent. of the production, and the corresponding bounty per 100 kilos. of the total production are given as follows :—

Season.	Bounty per 100 kilos. of Excess Yield.	Excess Yields per Cent. of Total Production.	Bounty per 100 kilos. of Total Production.
	frs.		frs.
1884–85	50	14·520	7·26
’85–86	50	29·400	14·70
’86–87 ...	50	36·440	18·22
’87–88	50	27·240	13·62
’88–89	40	26·190	10·47
’89–90 ...	40	28·540	11·41
’90–91	30	19·350	5·80
’91–92	30	23·830	7·15
’92–93	30	19·470	5·84
’93–94 ...	30	21·180	6·35
’94–95	30	21·730	6·52
’95–96	30	26·880	8·06
’96–97	30	21·610	6·48
’97–98	30	28·002	8·40

The "Economiste Français," in the course of a series of articles in opposition to the legislation of 1897, gave the following estimate of the total bounty, direct and indirect, for 1897-98 :—

The writer, M. Paul Leroy-Beaulieu, says :—"It is manifest "that with a yield of 11·20 per cent.,[3] our legislation will give to "our beetroot sugar manufacturers this year :—

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[3] That was his estimate at the time of writing.

	Per kilo. frs.
1. From 7 kilos. 75 to 10 kilos. 50 = 2 kilos. 75 at 30 frs. per 100 kilos...	0·825
2. From 10 kilos. 50 to 11 kilos. 20 = 0 kilos. 70 at 15 frs. per 100 kilos.[4]	0·105
3. The direct bounty on exportation, received also in the price for home consumption	0·400

Total per 100 kilos. of sugar produced .... 13·30

	frs.
This, merely on the quantity consumed in France, represents a charge on the consumer of 450,000 tons × 133 frs.	59,850,000
On the rest of the production, and on the colonial sugar, 350,000 + 100,000 = 450,000 tons × 93 frs.	41,850,000
To which must be added the bounty of 4 frs. per 100 kilos. on about 400,000 tons exported. 400,000 tons × 40 frs.	16,000,000

Total ... . 117,700,000 "

The direct bounty of 3·50 frs., 4 frs., and 4·50 frs. per 100 kilos. has been temporarily reduced since then, because the exports became so large that the sum set apart for the purpose was found to be insufficient. It will be restored to its original amount at the commencement of the next season.

The calculation of the "Economiste Français" is very striking. It is not quite correct, for reasons which I need not explain here, but it shows how the matter is viewed in France by sober economists. The real total bounty will come out, I think, very little over 100 million frs. A bounty exceeding 4 millions sterling per annum ought to be enough to enable the French producers, though still behind in the race, to make a good fight against Germany for supremacy in the world's markets, even though other conditions may not be equal.

It is impossible to give such accurate or authoritative figures of the German indirect bounty. We have, however, the materials for a calculation. From 1869 to 1883 the duty per 100 kilos. of roots was 1·60 marks, and the drawback per 100 kilos. of raw sugar was 18·80 marks. If the roots yielded $8\frac{1}{2}$ per cent. of raw sugar this drawback would be about correct. As soon as the yield rose above $8\frac{1}{2}$ per cent., the bounty began. The following statement and calculation, for which I am indebted to M. Dureau, the eminent specialist and editor of the "Journal des Fabricants de "Sucre," gives a very clear idea of the progress of the German bounty :—

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[4] Any yield above 10·50 per cent. is only allowed 15 frs. instead of 30 frs.

Season.	Roots per 100 Kilograms of Sugar.	Duty per 100 Kilograms of Roots.	Drawback per 100 Kilograms of Sugar.	Bounty per 100 Kilograms of Sugar.	Real Yield per Cent. of Roots.
	Kilograms.	Marks.	Marks.	Marks.	
1871–72....	1,207	1·60	18·80	− 0·512	8·28
'72–73....	1,211	1·60	18·80	− 0·576	8·25
'73–74....	1,212	1·60	18·80	− 0·592	8·25
'74–75....	1,075	1·60	18·80	+ 1·600	9·30
'75–76....	1,162	1·60	18·80	+ 0·208	8·60
'76–77...	1,220	1·60	18·80	− 0·720	8·19
'77–78....	1,075	1·60	18·80	+ 1·600	9·29
'78–79....	1,076	1·60	18·80	1·584	9·30
'79–80....	1,157	1·60	18·80	0·288	8·64
1880–81....	1,122	1·60	18·80	0·848	8·89
'81–82...	1,031	1·60	18·80	2·304	9·69
'82–83....	1,036	1·60	18·80	2·224	9·65
'83–84 ..	928	1·60	18·00	3·152	10·77
'84–85....	907	1·60	18·00	3·490	11·02
'85–86...	844	1·60	18·00	4·496	11·83
'86–87....	816	1·70	18·00	4·128	12·25
'87–88....	726	1·70	17·25	4·908	13·70
'88–89....	797	0·80	8·50	2·124	12·54
'89–90....	779	0·80	8·50	2·268	12·83
1890–91....	797	0·80	8·50	2·124	12·54
'91–92....	791	0·80	8·50	2·172	12·64

From 1871-72 to 1876-77, with exception of the seasons 1874-75 and 1875-76, the yield kept slightly below 8½ per cent., and there was no bounty. If you refer to the table of German production you will see that there was no marked increase until after that period. When we come to the period from 1877-78 onwards, we see the progress of the bounty from 1 mark up to nearly 5 marks per 100 kilos., and the production goes up from under 400,000 tons to over a million.

I have prepared another table which confirms this one very fairly. I have taken the German consumption from 1875-76 to the end of the period of the indirect bounty, 1891-92, and from it calculated what the revenue ought to have been at the various rates of drawback per 100 kilos. By the side of those results I have placed the actual revenue received. The variations tally fairly well with M. Dureau's table.

Season.	Consumption, not including Imports.	Duty at per 100 Kilograms.	Add Duty on Imports.	Total Duty should have been	Actual Duty Received.
	Tons.	18 Marks 80.	Marks.	Marks.	Marks.
1875–76....	302,144	56,803,072	5,672,000	62,475,072	63,249,000
'76–77....	230,678	43,367,464	3,354,000	46,721,464	48,536,000
'77–78....	283,806	53,355,528	2,369,000	55,724,528	49,816,000
'78–79....	292,289	54,950,332	2,112,000	57,072,332	50,545,000
'79–80....	281,222	52,869,736	1,730,000	54,599,736	54,206,000
'80–81....	279,578	52,560,664	1,481,000	54,041,664	46,149,000
'81–82....	293,864	55,246,432	1,518,000	56,764,432	56,877,000
'82–83....	371,951	69,926,788	1,730,000	71,656,788	67,287,000
		At 18 Marks.			
1883–84 ...	364,801	65,664,180	1,401,000	67,065,180	47,789,000
'84–85....	473,007	85,141,260	1,379,000	86,520,260	39,369,000
'85–86....	337,787	60,801,660	1,435,000	62,236,660	24,492,000
'86–87....	357,158	64,288,440	1,232,000	65,520,440	33,624,000
		At 17 Marks 25.			
1887–88....	398,163	68,683,117	1,858,000	70,541,117	14,677,000
		At 20 Marks.			
1888–89....	375,614	75,122,800	1,477,000	76,599,800	30,095,000
'89–90 ...	447,116	89,423,200	1,510,000	90,933,200	80,559,000
'90–91....	470,253	94,050,600	2,257,000	96,307,600	75,760,000
'91–92....	476,264	95,252,800	3,138,000	98,390,800	72,042,000
'92–93....	501,319	Duty of 18 marks levied on actual sugar			84,510,695
'93–94....	516,630				92,862,994
'94–95....	552,694				99,385,429

It will be observed from M. Dureau's table, that in 1883-84 the drawback was reduced to 18 marks, and in 1886-87 the duty on the roots was raised to 1 mark 70. In the following year the drawback was again reduced, and in 1888-89 the first step was taken towards abolishing the indirect bounty, by reducing the root duty to 0·80 mark and the drawback to 8 marks 50, and raising the rest of the revenue by a direct tax of 12 marks on the actual sugar. If these steps had not been taken, the revenue would have become a vanishing quantity.

From 1892 the whole duty was levied on the actual sugar, and a direct export bounty was given of 1 mark 25 per 100 kilos. on raw, and 2 marks on refined sugar. This was raised in 1896 to 2 marks 50 on raw and 3 marks 55 [5] on refined.

This is a bounty of 1s. 3d. to 1s. 9d. per cwt. given on exportation; but to the producer it amounts to a bounty of the same amount on his total production, because it is evident that he will not sell his sugar at two prices. Whatever prices he gets for export he will charge also to the home consumer. If he gets in the English market 11s. per cwt., free on board Hamburg, for his refined sugar, he receives 11s. plus 1s. 9d. bounty. Therefore he will certainly not charge less than 12s. 9d. for similar sugar sold to the home consumption, apart from the duty and from any

[5] See Appendix III, *post* p. 332.

further increase of price he may obtain by combination, which is always possible where outside sugar is more or less excluded by a wall of protection. We shall come to the consideration of this influence when we deal with the Russian industry.

A bounty on export is therefore obtained on the whole production. On the other hand, a bounty on production would gradually cease to be a bounty unless it were also obtainable on export, because it would eventually operate simply as a reduction of the duty on consumption. The producers would compete for the home market until they gave away all their advantage to the consumer. It is because the French indirect bounty is, as I have explained, obtainable on export, that it has been so completely secured by the producer on his total production. The combined direct and indirect bounties in France amount to at least 12 frs. per 100 kilos., or 5s. per cwt., as compared with 1s. 3d. to 1s. 9d. per cwt. in Germany. From this it is evident that if the war of bounties is to continue, Germany has more room than France for further increase of bounty, especially as the duty on sugar in Germany is only 20 marks per 100 kilos., while in France it is 60 frs. A speaker in the debate in the French Chamber in 1897 pointed this out. He said, " Germany has a consumption of " 700,000 tons, and a duty of only 25 frs. What if she replies " with a war of bounties ? She can do it, but you cannot." France with a bounty of 12 frs., a duty of 60 frs., and a consumption of only 400,000 tons, would find it difficult if not impossible to increase bounties and raise the necessary funds; whereas Germany has plenty of room for both operations.

The comparison of the exports and of the cost of production in these two countries shall be made after we have briefly reviewed the progress of beetroot production elsewhere; but before we leave this interesting contrast between France and Germany, a question naturally arises—why did the French producers remain, up to 1884, without any bounty to enable them to compete on more equal terms with their neighbours ? It is curious that during that very period the Paris refiners were enjoying their largest bounty, and were successfully resisting every diplomatic effort on the part of our Government to obtain its abolition. The explanation is, I think, to be found in the fact that France was more troubled than Germany with conflicting interests. In the first place, the French sugar producing colonies would naturally regard with hostility any artificial encouragement to the home production. Secondly, the existence of these colonies had created another interest which would be equally opposed to any stimulus to the beetroot industry. The refineries of the French Atlantic and Mediterranean ports existed for the purpose of refining the cane sugar imported from

the colonies. A third opposing interest was the great refining industry in Paris, which indeed used beetroot sugar as its raw material, but which was opposed to any such expansion of the beetroot industry as was taking place in Germany.

These conflicting interests sufficiently account for the isolated position of the French beetroot industry previous to the radical change in 1884, and for many incidents in that and the subsequent legislation of 1897. The elaborate machinery for giving equivalent bounties to the colonies, the extension of the surtax to foreign cane sugars, and the consequent necessity for the *détaxe de distance*, are all involved in this conflict of interests. It was only when the very existence of the French beetroot industry was at stake, that the Government were obliged to face these cross purposes and try to devise a scheme which should satisfy every demand. They have plunged into a labyrinth which is likely to furnish them with more puzzles.

2. *Austria. Revenue a Minus Quantity.*

Leaving France and Germany for the moment, we turn to the progress of sugar production in Austria.

Production of Sugar in Austria-Hungary from 1871-88.

	Tons.		Tons.
1871–72	213,000	1880–81	511,000
'72–73	231,000	'81–82	438,000
'73–74	242,000	'82–83	492,000
'74–75	226,000	'83–84	470,000
'75–76	277,000	'84–85	653,000
'76–77	290,000	'85–86	370,000
'77–78	346,000	'86–87	550,000
'78–79	389,000	'87–88	400,000
'79–80	410,000		

Production of Sugar in Austria-Hungary after the creation of the Direct Bounty, 1888-97.

	Refined.	Raw.	Total.
	Tons.	Tons.	Tons.
1888–89	352,037	130,012	482,049
'89–90	520,119	162,662	682,781
'90–91	501,956	208,300	710,256
'91–92	485,480	234,772	720,252
'92–93	573,103	155,408	728,511
'93–94	658,214	100,020	758,234
'94–95	739,412	220,371	959,783
'95–96	645,383	61,109	706,492
'96–97	691,415	158,452	849,867

It will not be necessary to dwell long on its statistical aspect, because it is very much a repetition of the German experience, though at first on an exaggerated and unreasonable scale. The

duty in Austria was levied on the roots, but the quantity of roots, instead of being ascertained by weight, was estimated according to the supposed capacity of the apparatus used for extracting the sugar. The manufacturer therefore had not only the advantage, as in Germany, of an incorrect estimate of the quantity of sugar produced from the roots, but also the further advantage of an erroneous estimate of the capacity of the apparatus. For some years his main object was to deceive the authorities by erecting new apparatus which should work more roots than the official estimate. The exports naturally show a considerable increase, because the drawback exceeded the duty more and more each year, and the revenue from sugar gradually dwindled until at last it became a minus quantity. The sugar duty actually became a loss instead of a gain to the Austrian treasury. Here are the figures of this curious process :—

Season.	Gross Revenue.	Drawback on Exports.	Net Revenue.	Exports.
	florins.	florins.	florins.	Tons.
1867–68........	7,368,276	1,805,117	5,563,159	23,497
’68–69........	6,069,617	77,528	5,992,089	?
’69–70........	9,011,797	4,742,147	4,269,650	65,556
’70–71........	11,659,740	7,306,653	4,353,087	92,119
’71–72........	9,977,212	5,817,097	4,160,115	62,332
’72–73........	12,697,926	6,410,106	6,287,820	87,086
’73–74........	10,095,558	7,152,491	2,943,067	63,163
’74–75........	7,201,007	5,458,683	1,742,324	82,590
’75–76........	9,337,435	9,472,991	— 135,556	126,556
’76–77........	10,876,187	10,479,973	+ 396,214	144,656

This disappearance of revenue was corrected by the law of 1878, which, while retaining the vicious system of estimating the quantity of roots according to the supposed capacity of the apparatus, protected the treasury by insisting on a minimum revenue, with a gradual yearly increase.

This seems at last to have considerably checked the bounty, as the following figures indicate :—

	Compulsory Net Revenue.	Exports.
	florins.	Tons.
1882–83............	10,800,000	270,132
’83–84............	11,200,000	239,932
’84–85............	11,600,000	349,511
’85–86............	12,000,000	188,141
’86–87............	12,400,000	274,458
’87–88............	12,800,000	177,014

This gave rise to loud complaints from those engaged in the

industry, and consequently, at their urgent request, in 1888 the system of levying the duty on an estimated yield was abolished. The duty is now levied on the actual sugar as it enters into consumption; no drawback is necessary on exportation, and therefore the bounty from that source has ceased. Austria, like Germany, has substituted a direct bounty, until a general agreement to abolish bounties has been arranged. The direct bounty is 1 fl. 60 per 100 kilos. on raw sugar and 2 fl. 30 on refined, equal to 1s. 4d. and 1s. 11d. per cwt. This bounty was considerably larger than the original German direct bounty, and is apparently rather larger than the increased bounty in Germany, but is not so in reality, because a maximum annual bounty was fixed at 5 million florins in 1888, and raised in 1896 to 9 millions. As the manufacturers have always exported so largely that the bounty received has exceeded the fixed maximum, they have had to refund a portion at the end of each year. They, however, enjoy a certainty of 9 million florins per annum, which is quite sufficient to stimulate production. As the bounty on refined is very much too large compared with that on raw, it will be noticed that the increase in the production of refined is very striking.

The total production at the close of the indirect bounty period, when the bounty had almost, perhaps quite, disappeared, gradually sank from 600,000 to 400,000 tons. At the beginning of the direct bounty period it quickly rose to 700,000 tons, and then to nearly a million, while the portion which was refined rose from 350,000 to 740,000 tons.

Here, then, as in the case of France and Germany, fluctuations in bounty are well reflected in the figures of production.

3. *Belgium and Holland.*

Production and bounties in Belgium will not detain us long, for no one, not even the most erudite, can say what the production, or consumption, or bounty in that country really amounts to. All that we know with certainty is that the system involves a bounty of considerable dimensions, which at times has been indefinitely increased by the fraudulent practices which the Belgian law so temptingly invites.

The duty is levied neither on the sugar nor the roots, but on the density of the juice. It may be easily imagined, without entering into elaborate descriptions, how such a system can enable a large portion of the production to escape the duty. A few figures are sufficient to prove it, and even the most recent ones, when every precaution has been taken to defeat fraud, will answer the purpose:—

Year.	Production, Estimated by Density of Juice.	Imports.		Exports.	
		Raw.	Refined.	Raw.	Refined.
	Tons.	Tons.	Tons.	Tons.	Tons.
1883	106,586	16,974	6,921	95,643	9,653
'84	88,462	16,413	6,442	58,451	9,285
'85	48,420	14,104	2,748	62,138	8,759
'86	91,119	12,025	1,038	87,999	10,391
'87	93,571	13,692	650	94,837	16,731
'88	95,803	13,235	405	68,254	19,691
'89	173,042	11,922	402	153,288	22,560
1890	159,114	13,574	389	135,889	21,890
'91	140,376	12,718	410	108,634	24,677
'92	143,698	12,934	1,068	101,088	29,948
'93	188,326	10,970	830	170,066	38,171
'94	208,956	9,143	593	95,841	27,887
'95	182,247	9,858	518	124,006	48,234
'96	235,041	9,358	468	127,404	52,596
'97	212,040	9,768	377	179,042	56,985
Total	2,166,801	186,688	23,259	1,662,580	397,458
		2,376,748		2,060,038	

The total estimated production and imports amounted, in the last fifteen years, to 2,376,748 tons, and the exports to 2,060,038 tons, leaving only 316,710 tons, or 21,114 tons per annum for home consumption. The Belgian Government may well put the following footnote to the above table :—

"The figures relating to the production of sugar are approxi- "mative, the duty being based on a presumed yield. For the "same reason it is impossible to indicate with precision the "quantity of sugar consumed in Belgium."

Here, then, we have statistics which illustrate nothing, except that the Belgian sugar system is about as bad a one as could be devised ; and yet, at all our international conferences of the last twenty-five years, Belgium always stands in the way by declaring that, however necessary reform may be in other countries, its system is too sacred to be touched.

The revenue is protected by a compulsory minimum annual revenue of 6,000,000 frs.

The Dutch system was much the same, but in 1897 it was abolished and replaced by excise supervision, the duty being levied on the actual sugar. Small direct bounties are now given, amounting in 1897-98 to 2,500,000 florins to the beetroot sugar manufacturers, and 500,000 florins to the refiners, and gradually declining to 1,700,000 florins and 250,000 florins in 1905-06.

The production for the last fourteen years is stated officially as follows :—

Season.	Production, according to the Density of the Juice.	Excess Yield.	Total Production.
	Tons.	Tons.	Tons.
1884–85	32,293	2,925	35,218
'85–86	18,883	2,851	21,735
'86–87	28,694	5,193	33,888
'87–88	30,066	5,231	35,297
'88–89	27,580	5,460	33,041
'89–90	46,510	10,464	56,975
'90–91	51,089	11,546	62,635
'91–92	31,244	7,873	39,117
'92–93	45,379	10,951	56,330
'93–94	49,994	11,916	61,910
'94–95	61,334	9,757	71,092
'95–96	77,388	12,786	90,175
'96–97	126,359	17,042	143,402
	Actual Production.		
1897–98	120,269	—	120,269

An official note states that previous to 1884-85 the production was unknown, but that since then it is stated in accordance with careful estimates of officials charged with supervision of the factories. The *régime* for levying the duty previous to September, 1897, did not permit of precisely determining the consumption.

During the five seasons 1889-90 to 1893-94, the excess yield appears to have been as high as 23 per cent., which must have given a very substantial bounty. This stimulated production ; but the excess yield was reduced to 15 per cent. of the production, and the amount of the bounty fell in proportion. The matter, however, is of comparatively small importance, because the average exportation of home made raw sugar from Holland has only averaged, during the thirteen years 1885-97, 7,844 tons per annum.

Holland, in addition to being a producer of beetroot sugar, is, for its size, a large importer of raw sugar and exporter of refined. Up to 1897 the refiners enjoyed a considerable indirect bounty, similar to that obtained by the Paris refiners, owing to the yield of refined being incorrectly estimated.

The following are the imports of raw and exports of refined since 1883 :—

Year.	Imports of Raw.	Exports of Refined.
1883	115,923	69,527
'84	123,586	88,745
'85	110,994	79,561
'86	87,014	74,183
'87	100,002	84,367
'88	98,916	82,724
'89	90,516	79,756
'90	111,032	102,338
'91	92,183	100,594
'92	115,968	111,172
'93	100,195	100,954
'94	106,336	104,059
'95	94,877	110,759
'96	67,110	123,819
'97	57,978	121,542

It was the existence of the Dutch sugar colonies, no doubt, which gave rise to the sugar refining industry in Holland. The industry continues, though the original reason for it has gone. The imports are now mostly beetroot from neighbouring countries, and these imports are gradually giving way to the increasing supply from the Dutch beet fields.

4. *Russia. A Curiosity in Legislation.*

We now come to a more interesting subject, the sugar production in Russia.

The Russian system at present in force deserves some attention. Formerly, when the sugar producers found themselves inconveniently burdened with a surplus stock, the paternal Government came to the rescue with a temporary export bounty, sometimes on both the European and Asiatic frontiers, at other times for the Asiatic frontier only. In 1887 the sugar producers endeavoured to do without Government assistance by forming a syndicate for the purpose of keeping up prices in the home market. But competition eventually defeated this effort in 1894. The manufacturers then asked for a permanent bounty similar to those given to their neighbouring competitors in Germany and Austria. The Russian Government, though declining to accede to this request, undertook to do what the producers had failed to accomplish—keep up for them a sufficiently high price in the home market to enable them to continue their production, and to make a handsome profit even if obliged to export their surplus production at a loss. The plan was arranged with much skill, and has been so successful that the Russian sugar producer is now as secure as if he received a direct bounty from his Government. Sure of a profit of 6s. to 7s. per cwt. on his total production, he has every inducement to increase

it, and Russia has plenty of spare land suitable for the growth of sugar beet. The system is worth considering for a moment. The first thing necessary for such a scheme is a good high wall to exclude imports. It is there, and sufficiently high. To carry out the rest of the arrangement a special law was passed in 1895, in accordance with which the Council of Ministers determines for each year, (1) the quantity of sugar necessary for the home consumption; (2) the quantity of sugar to be kept in reserve in case prices should rise beyond the fixed limit; and (3) the fixed limit of price. Each manufacturer, whether he be great or small, is allowed to put 982 tons into the home market. Beyond that quantity he is obliged to put aside his proportion of the reserved stock. The balance beyond these quantities is divided in such a way that each manufacturer has the privilege of selling for home consumption a quantity *in proportion to his total production.* Any excess he must export, or pay double duty upon it. The maximum price fixed by the Russian Government for home consumption is, after deduction of the duty, nearly double the price in outside markets. As this maximum price is usually maintained, the Russian manufacturers secure by Government assistance a profit of 9s. to 10s. per cwt. on the 500,000 tons which they sell for home consumption; and though each one naturally increases his production every year in order to secure a larger share of this profitable trade, they can afford to get rid of the extra 150,000 tons at cost price, or even at a loss of 1s a cwt., and yet secure the enormous profit of 6s. to 7s. per cwt. on their total production. The question arises, Is this profit, which is thus secured to them by law, a State bounty? It is certainly an artificial stimulus to over production, with a compulsion to export the surplus.

If the arrangement were made final, each factory enjoying a fixed proportion of the home consumption without increase, there would be no stimulus to over production, and the international objection to the system would be removed. New factories would then be limited to the requirements of increased consumption.

It is interesting to note that the Russian consumption is increasing with remarkably rapid strides, in spite of the high price the consumer has to pay. Probably it is not an increase per head, but arises solely from the constant extension of the Empire. The last three years show an increase of nearly 50,000 tons a year.

	Tons.
1895–96	455,364
'96–97	505,716
'97–98	540,540

The last is an estimate, which I know has been exceeded, but I cannot yet give the exact figure.

Previous to 1881 the duty was charged on the roots, according to the supposed capacity of the apparatus. This gave an indirect bounty, said to be equal to about 7 frs. per 100 kilos. Since then a strict system of excise supervision has been in force, with duty levied on the actual sugar, so that this indirect bounty has disappeared. In 1885 a temporary direct bounty equal to about 13 frs. per 100 kilos., subsequently reduced to about 10 frs., was given, in order to relieve the manufacturers of their accumulated stocks. This led to an exportation of 124,198 tons during the season 1885-86. This bounty was withdrawn in July, 1886, from sugars exported over the European frontier, and the European exports consequently fell from 119,966 tons almost to zero. The bounty was continued for the Asiatic frontier, and the exports in that direction continued on a large scale. In the eleven years 1885-95, the exports have averaged 72,614 tons per annum. In 1896 the exports went up suddenly to 221,596 tons. The Russian delegate at the recent Brussels conference gave the following explanation: " The exports have varied from 2 to 7 million pounds " in recent years; in 1896 they were 13 million pounds, owing to a " modification of legislation which brought about the liquida- " tion of stocks accumulated by the syndicate."

The following table gives the progress of sugar production in Russia :—

	Tons.			Tons.			Tons.
1875–76	159,002	1883–84		308,922	1890–91		466,427
’76–77	207,527	’84–85		343,294	’91–92		485,664
’77–78	173,675	’85–86		475,668	’92–93		399,480
’78–79	181,835	’86–87		425,054	’93–94		578,469
’79–80	205,481	’87–88		389,009	’94–95		537,306
’80–81	203,110	’88–89		465,082	’95–96		679,471
’81–82	261,043	’89–90		403,052	’96–97		635,552
’82–83	287,270						

Russia is the only beetroot country which is erecting new factories on an extensive scale. Such an artificial profit as I have indicated, coupled with the large natural expansion of the Russian consumption, will undoubtedly operate in that direction.

II.—*Exportation.   France, Germany, and Austria.*

In dealing with the exportation from France, we will first look at her exports of refined sugar, and in doing so we must go rather further back into the regions of the past, because, as I mentioned at the outset, it was the exportation of French refined sugar which, some thirty years ago, first created "the sugar " question " :—

Exports of French Refined Sugar.

		Tons.			Tons.			Tons.
1860–61	....	66,627	1873–74	....	194,288	1886–87	....	117,225
'61–62	....	68,223	'74–75	....	232,025	'87–88	....	153,923
'62–63	....	103,867	'75–76	....	269,337	'88–89	....	115,907
'63–64	....	134,302	'76–77	....	234,228	'89–90	....	139,844
'64–65	....	118,133	'77–78	....	198,295	'90–91	....	152,840
'65–66	....	149,639	'78–79	....	174,902	'91–92	....	121,053
'66–67	....	120,084	'79–80	....	151,916	'92–93	....	126,576
'67–68	....	116,400	'80–81	....	130,448	'93–94	....	113,783
'68–69	....	102,596	'81–82	....	117,149	'94–95	....	130,881
'69–70	....	121,043	'82–83	....	118,997	'95–96	....	119,901
'70–71	....	125,478	'83–84	....	122,683	'96–97	....	110,764
'71–72	....	98,345	'84–85	....	113,674	'97–98	....	146,716
'72–73	....	178,977	'85–86	....	71,166			

Even in 1860 the French refiners enjoyed a bounty on export. The raw sugar was estimated to yield a certain quantity of refined, but it really yielded more. As time went on and men became cleverer, this difference between the real and the estimated yield became more pronounced. The international convention of 1864 was intended to remedy the evil, but quite failed to do so, partly owing to the inherent vice of the system, partly to the failure of France to carry out the terms of the treaty, but still more to the clever way in which Paris refiners made the most of the defects of the system. They not only took care to use only the highest sugar in each class, but they did not hesitate to avail themselves of every expedient for falsifying the appearance of the raw sugar in order to lower its classification. By these means the bounties to the Paris refiners were rapidly increased, and when the sugar duty was nearly doubled, after the war of 1870, their bounties were consequently by a stroke of the pen also doubled. The figures of the table show the result, a great increase in exportation from 1872 to 1879. During those years the British refiners made persistent efforts to obtain some international remedy, and though they failed, in spite of several international conferences, to obtain a convention for the abolition of bounties, their efforts were not without result. The full investigation of the question, at the conferences of 1875, 1876, and 1877, resulted at all events in the French Government taking some precautions, on their own account, to check the increase in the bounties, by means of what they called saccharimetric control of the refineries. This began in 1877, and was more fully carried out in 1880. The effect on the exports is manifest. Ten years later, after the abortive conferences of 1888, the French Government in 1890 again acted on its own motion, and finding saccharimetry ineffectual, at last adopted, to a certain extent, the system of refining in bond which

the British sugar refiners had for twenty years been urging as the only real remedy for the evil.

The exports, which had risen to 152,000 tons in 1890-91, fell gradually to 110,000 tons in 1896-97. In the following year they rose to 146,000 tons, owing to the new direct bounty.

The monster exports of 1873-76 succeeded in entirely removing for a time British loaf sugar from British markets.

There were some who then foretold that the same would happen with other classes of British refined sugar, owing to the impending competition from the growing bounties in Germany and Austria. The following figures prove that those prophesies were not without foundation :—

Exports of Refined Sugar from Germany.

	Tons.			Tons.			Tons.
1871–72	5,809	1880–81	....	56,060	1889–90	....	225,228
'72–73	7,980	'81–82	....	54,329	'90–91	....	235,758
'73–74	6,743	'82–83	....	73,599	'91–92	....	230,597
'74–75	5,481	'83–84	....	94,114	'92–93	....	270,607
'75–76	7,245	'84–85	....	107,900	'93–94	....	261,343
'76–77	11,735	'85–86	....	86,588	'94–95	....	391,716
'77–78	22,345	'86–87	....	154,261	'95–96	....	407,447
'78–79	30,752	'87–88	....	152,956	'96–97	....	426,304
'79–80	34,941	'88–89	....	179,802	'97–98	....	503,928

Exports of Refined Sugar from Austria.

	Tons.			Tons.			Tons.
1874–75	29,993	1882–83	....	124,725	1890–91	....	234,080
'75–76	39,887	'83–84	....	137,955	'91–92	....	227,725
'76–77	38,563	'84–85	....	111,780	'92–93	....	285,140
'77–78	56,730	'85–86	....	139,705	'93–94	....	360,153
'78–79	74,915	'86–87	....	167,228	'94–95	....	351,711
'79–80	67,547	'87–88	....	112,508	'95–96	....	305,227
'80–81	90,208	'88–89	... .	150,341	'96–97	....	417,238
'81–82	100,513	'89–90	....	245,658	'97–98	....	460,154

In 1878-79, when the Select Committee of the House of Commons was investigating the question, and warning was given of what was about to take place, the German exports of refined sugar had risen from 5,809 tons in 1871-72, to 30,752 tons. They now amount to 503,928 tons. The Austrian exports of refined had risen from 29,993 tons in 1874-75, to 74,915 tons. They now amount to 417,238 tons. The evidence given before that committee, and the conclusions to which it came, have therefore been completely justified.

In comparing the exports of raw sugar from the three countries, it must be borne in mind that though the raw sugar exported from France is called raw, the greater part of it is practically refined

sugar. I give the exports of the three countries side by side for the last fifteen years :—

	France.	Germany.	Austria.
	Tons.	Tons.	Tons.
1883–84	42,236	491,176	131,019
'84–85	18,752	553,793	180,154
'85–86	2,782	404,071	126,201
'86–87	19,446	489,680	97,593
'87–88	3,945	344,710	52,721
'88–89	41,447	412,424	123,484
'89–90	119,714	493,830	139,511
'90–91	179,990	488,240	215,367
'91–92	147,589	436,671	214,518
'92–93	88,526	424,744	164,498
'93–94	139,585	436,674	89,910
'94–95	147,364	609,662	62,095
'95–96	85,206	504,444	165,787
'96–97	112,256	760,657	101,485
'97–98	306,418	478,941	31,449

The French exports went up, as soon as the indirect bounty of 1884 had had time to develop, from an average of 21,000 tons in the six years 1883-89, to an average of 127,500 tons in the eight years 1889-96. In the year 1897-98, the first year of the additional direct bounty, they jumped to 306,000 tons.

The Austrian exports of raw sugar show the effect of the larger bounty on refined. They are evidently decreasing, in spite of the large increase in production. In 1896-97 they were only 101,000 tons, while the exports of Austrian refined had risen to 417,000 tons. Germany divides its favours more equally, and exported 760,000 tons of raw and 503,000 tons of refined. But it may be observed that when the direct bounty was established, giving a larger bounty on refined than on raw, the exports of refined increased rapidly. The two countries together now supply the world yearly with 920,000 tons of refined and 860,000 tons of raw sugar. Thus the rest of the world is now dependent on those two countries alone for 1,780,000 tons of its supply of sugar, that is, for more than a quarter of its consumption.

III.—*Cost of Production. Cane* versus *Beet.*

So far it is evident that the production and exportation of beetroot sugar has been to a certain extent—some might say mainly—influenced by bounties. But it may be urged on the other hand that this is only a minor factor in the case, and that the beetroot industry has taken the lead in the sugar production of the world from other more important and more permanent causes. Let us see what foundation there may be for such a supposition.

One thing is quite certain, it has been the salvation of the continental farmer throughout all the districts to which the industry has extended. High farming has been necessary, and this has resulted in great improvement in the crops of wheat or other cereals which have formed part of the rotation. Again, the refuse pulp has been a most valuable food for cattle, and has thereby greatly increased the head of live stock. A third advantage has been the extra employment for farm labourers on the land and for skilled labour and general workmen in the factories. As a rule protection is a bad thing, but in this case the German Government have applied protection in such a form as to do the greatest amount of good to the country with the least possible harm. The question is, What will become of this industry when bounties finally disappear?

The cost of production of beetroot sugar depends on the yield of roots per acre, the yield of sugar from the roots, the cost of cultivation per acre, and the cost of extracting the sugar from the roots. In all these points Germany is ahead of her competitors.

The following figures give the quantity of roots produced per hectare ($2\frac{1}{2}$ acres) in France and Germany in each of the last seventeen years :—

	France.	Germany.
	Tons of roots per hectare.	Tons of roots per hectare.
1881–82	33·791	28·3
’82–83	34·928	34·4
’83–84	35·356	29·9
’84–85	31·289	32·9
1885–86	29·457	30·2
’86–87	31·900	30·0
’87–88	22·469	26·4
’88–89	24·537	28·2
’89–90	32·364	32·9
’90–91	29·319	32·8
’91–92	25·119	28·2
’92–93	25·605	27·9
’93–94	23·863	27·5
’94–95	29·553	32·9
’95–96	26·434	31·0
’96–97	27·477	32·3
’97–98	27·708	31·3
Average of the last thirteen years	27·370	30·0

Up to 1885 France was growing poor roots, and consequently produced a larger tonnage of roots to the acre. Since 1885 she has been under the German system, which involves small rich roots, but has only succeeded in the thirteen years in producing an average of 27·37 tons to the hectare, against an average of 30 tons produced in Germany during that period.

If we take the quantity of sugar produced each year, and divide it by the number of hectares cultivated, we get a still more striking illustration of the superiority of Germany :—

	France.		Germany.	
	Hectares.	Sugar per Hectare.	Hectares.	Sugar per Hectare.
		Tons.		Tons.
1871–72...............	156,700		110,303	
'72–73................	190,000		125,413	
'73–74................	184,000		129,733	
'74–75................	209,000		133,822	
'75–76................	214,000		142,023	
'76–77................	115,000		140,790	
'77–78................	185,000	1·83	149,633	2·7
'78–79................	200,000		160,154	
'79–80................	129,000		190,684	
'80–81................	153,000		193,308	
'81–82................	190,300		221,623	
'82–83................	206,000		254,278	
'83–84................	206,800		298,271	
'84–85................	148,800		316,191	
'85–86................	112,800		234,116	
'86–87................	155,800		276,889	
'87–88................	161,300		263,786	
'88–89................	172,200		280,361	
'89–90................	206,200		298,560	
'90–91................	221,600	2·63	329,917	3·8
'91–92................	222,900		336,454	
'92–93................	217,600		352,015	
'93–94................	220,000		386,481	
'94–95................	241,500		441,441	
'95–96................	204,600		376,669	
'96–97................	246,204		424,881	
'97–98................	231,050	3·15	437,174	4·3

During the years 1871-72 to 1884-85 Germany produced an average of 2·7 tons to the hectare, or 1·08 tons to the acre, against 1·83 to the hectare or 0·73 to the acre in France. From 1885-86 to 1896-97 the average production in Germany had increased to 3·8 tons to the hectare, or 1·52 tons to the acre, against 2·63 to the hectare, or 1·05 to the acre, in France. At present it is 4·3 tons to the hectare, or 1·72 tons to the acre, in Germany, against 3·15 to the hectare, or 1·26 to the acre, in France.

I have worked out in this way the yield of sugar per acre for the last three years for each of the six principal beetroot countries; the result is as follows :—

	Tons of Sugar per Acre.		Tons of Sugar per Acre.
Germany	1·71	France	1·24
Belgium	1·55	Austria	1·09
Holland	1·29	Russia	0·80

From these figures the present average production per acre for the six countries, according to the proportional crop of each country, comes out at 1·327 tons per acre.

How does this figure compare with results of cane sugar in the tropics? From the returns of large estates in Trinidad and British Guiana, I find that the average result for the last nine years has been 1·54 tons per acre in Trinidad, and 1·82 tons per acre in British Guiana. The estates of the central factories in St. Lucia produce 1·75 tons of sugar to the acre. In Barbados, according to evidence given before the Royal Commission, the production is 1·89 tons of sugar per acre. In more favoured countries, such as Java, the Sandwich Islands, and Egypt, we hear of much higher yields.

A German specialist gives the following average figures for Germany, Java, Queensland, and Hawaii:—

Germany...............	4 tons of sugar per hectare	= 1·6 tons per acre.		
Java.........................	8	,,	= 3·2	,,
Queensland............	4½	,,	= 1·8	,,
Hawaii	9	,,	= 3·6	,,

He adds that in Cuba some factories exceed the average of Java.

It is stated that in Java, this last season, 4 tons of sugar to the acre was not an uncommon yield. From all that I have been able to gather on this point, I am inclined to think that 2 tons to the acre for the whole of the cane sugar countries, as an average yield, would be well within the mark.

When we come to total cost of production, the superiority of cane over beet becomes even more distinct. From the full account given in the appendix to the Report of the Royal Commission, of the cost of production in one of the most important sugar factories in Germany, it would appear that sugar cannot be produced without a bounty, even in that favoured country, much under 10*l.* per ton.

The German expert already quoted gives the following simple calculation of the cost of production in Germany; but it must be noted that a cwt. of sugar is now sometimes produced from less than 8 cwt. of roots. Cost of manufacture, 5*d.* per cwt. of roots. Price of roots, 10*d.* per cwt. 8 cwt. of roots to 1 cwt. of sugar:—

$$
\begin{array}{rl}
 & s. \quad d. \\
8 \times 10d. = & 6 \quad 8 \\
8 \times 5d. = & 3 \cdot 4 \\
\hline
 10 \quad - & \text{Cost of sugar per cwt.}
\end{array}
$$

Some of the newest and largest factories work at even less expense than that, but it would not be fair to take them as representing the cost throughout Germany, still less the cost throughout Europe.

I have the average cost of manufacture of 68 German factories, together with the average price paid by them for the roots. These factories consist of 21 very large ones, 39 medium sized ones and 8 small ones. From their figures I should have to make the following modification of the above estimate:—

$$
\begin{array}{rll}
 & s. & d. \\
8 \times 10\frac{1}{2}d. = & 7 & - \\
8 \times 4\frac{1}{4}d. = & 2 & 10 \\
\hline
 & 9 & 10 \quad \text{Cost of sugar per cwt.}
\end{array}
$$

Of these factories, 4 worked more than 100,000 tons of roots, and the next 17 more than 50,000 tons. Thirty-nine out of the 68 were beyond the average capacity of German factories, which is 34,390 tons. The figures therefore represent something below the average cost for the whole of Germany.

A great deal of course depends on the price paid for the roots, and this varies considerably. In France at the present time, with the high bounty, as much as 27 frs. per ton is being paid for roots, while in Germany the price is about 21 to 22 frs. It is evident from the figures of sugar per acre, that whatever may be the average total cost of production in Germany, which certainly cannot be much less than 10*l.* per ton for the whole country, the cost in all the other countries must be considerably higher. There is another reason why this must be so. The cost of extracting the sugar from the roots must inevitably be less in a large than in a small factory, and it may be said to decrease with the increase in the size of the factory. The factories in France are a respectable size, but they are very much smaller than those in Germany. At the present time the average capacity of the French factories is 18,610 tons of roots per factory, as compared with 34,390 tons per factory in Germany. In 1881-82 the figures were 13,300 tons of roots per factory in France, as compared with 18,285 tons per factory in Germany. For all these reasons we must admit that if 10*l.* a ton fairly represents, for the whole of Germany, the cost of production, that cost must be considerably higher for the whole of Europe.

Turning to the cost of producing cane sugar, I find that on the leading estates in British Guiana and Trinidad the cost ranges from 9*l.* 12*s.* 6*d.* per ton down to 8*l.* –*s.* 6*d.* In St. Lucia the cost

of production on the central factory estates is stated to be 8*l*. 15*s*. The average of the figures I have examined comes out, for cost of production in the West Indies, at 8*l*. 16*s*. 8*d*. per ton. The expenses of estates in Queensland have lately been published. The average of eight estates, whose figures I have seen, comes out at 8*l*. 6*s*. 3*d*. per ton. From Java I have figures which show a cost of 8*l*. 10*s*.

The German authority gives the following figures :—

	per cwt. *s.*		per cwt. *s.*
West Indies	8·98	Queensland	8·05
Egypt	9·09	Hawaii	8·22

In making this comparison between the cost of production of beet and cane sugar, it is well to keep in mind the fact that while the stimulus of bounties has hastened the attainment of perfection in the cultivation and manufacture of beetroot sugar, there is still great room for improvement in cane, and that consequently the future, with a fair field and no favour, or even without it, is likely to widen the existing gap between the cost of production in the two cases.

Without going further into the matter, I think we may fairly say, in round numbers, that the whole crop of beetroot sugar costs considerably more than 10*l*. per ton, and the whole crop of cane sugar considerably less than 9*l*. per ton.[6]

This means that without bounties the beetroot producers must content themselves with supplying their own markets and the neighbouring countries. With a large reduction of duty and consequent increase of consumption this change might take place without any serious shrinkage in the production.

In British markets beetroot would probably be able to a certain extent to compete with cane on equal terms, the lower freight being some counterpoise to higher cost of production.

IV.—*Price.*

This is an interesting chapter in the statistical aspect of the sugar question, and fortunately it is brief.

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[6] The bulk of the production of raw beetroot sugar is sold on the basis of 88 per cent. net analysis, whereas the greater part of the produce of good cane sugar factories is sold on the basis of 96 polarization, which is equivalent to a net analysis of about 92 per cent. Therefore when we compare the cost of manufacture of beet and cane, we are really comparing the cost of an inferior with that of a superior article. The difference in market value between the two is even greater than the difference between 88 and 92 per cent. of extractible sugar.

The Board of Trade give us the following average prices of sugar consumed in the United Kingdom in each year from 1872 to 1897. The prices are without the duty.

	Raw Sugar. per Cwt.		Refined Sugar. per Cwt.			Raw Sugar. per Cwt.		Refined Sugar. per Cwt.	
	s.	d.	s.	d.		s.	d.	s.	d.
1872	26	2	36	4	1885........	13	10	18	2
'73	24	–	33	10	'86........	13	–	16	8
'74	22	5	30	8	'87........	12	1	15	8
'75	21	2	30	4	'88........	13	5	17	6
'76	21	–	29	5	'89........	15	5	19	8
'77	25	9	33	9					
'78	21	6	29	3	1890........	12	6	16	4
'79	20	3	27	5	'91........	12	10	16	6
					'92........	13	–	17	1
1880	21	9	29	3	'93........	14	2	18	4
'81	21	9	28	11	'94........	11	5	15	6
'82	21	1	28	8	'95........	9	7	13	4
'83	20	1	27	2	'96........	10	5	13	7
'84	15	6	20	11	'97........	9	–	12	3

The fall in price is very striking. In 1884 a great drop took place, and sugar had to take an altogether new level. There can be little doubt that over production of beetroot sugar brought on, somewhat prematurely, this great revolution. I shall, however, endeavour to show, from the figures of cost of production, that the abolition of bounties would not deprive the consumer—under which term I include confectioners and other large users of sugar— of the benefit of these low prices, but would probably give him a still lower level. I will even try to show that the consumer has not benefited by the low prices so thoroughly as he might have done if there had been no artificial over production. I admit that the over production precipitated the crisis, and that we probably got low prices a year or two earlier than we might have done under natural conditions. I will also admit that the fall was more sudden and exaggerated than it might have been without bounties; but that turned out to be rather a disadvantage to the consumer.

The figures for the fourteen years 1884-97 are the ones to which we must specially direct our attention. If we take the average of these fourteen years, we find that during that period the average price of raw sugar was 12s. 7d. per cwt.

But if we look a little closer at details, we find very wide fluctuations. I give the highest and lowest price for each year : —

Price per Cwt. of 88 Beetroot Sugar, f.o.b. Hamburg.

[From Clark and de Silva's Circular.]

	1884.		1885.		1886.		1887.		1888.		1889.		1890.		1891.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Average price...	14	–	14	–¼	12	1	11	9	14	–	16	10	12	6¾	13	6
Highest price...	18	1½	17	–	15	9	15	6	16	3	28	3	14	3	14	10⅓
Lowest price...	9	9	10	–	10	–	10	6	12	6	11	–	11	6	12	3

	1892.		1893.		1894.		1895.		1896.		1897.		1898.		Average 15 Years.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Average price...	13	7½	15	5¼	11	6¾	9	10½	10	6	8	10¼	9	5¼	12	6½
Highest price...	14	11½	19	–	13	1½	11	1½	12	10½	9	4½	10	3¼	—	
Lowest price...	12	5¼	12	2¼	8	6¾	8	5¼	8	7½	8	2¼	8	11½	—	

At the beginning, in 1885, the price fell to 10s. 3d., and rose, when production was checked, to 16s. 9d. The same happened in 1886, a fall to 10s. 3d. followed by a rise to 16s. Similar fluctuations were reported in the two following years. Then there came a deficient beetroot crop, and prices rose, in 1889, to 28s. 3d. They fell again to 11s. 6d., but in 1893 there was another rise to 19s., followed by a fall to 12s. 6d. Since then there have been smaller fluctuations, between 8s. 3d. and 12s. 9d.

With the exception of one small rise in 1896, all these fluctuations came from the vicissitudes of the beetroot crop. The first big fall caused a sudden reduction in the production of beetroot sugar, which brought about a rise in price of 6s. 6d. per cwt. The next fluctuations were repetitions of the first. The fifth was the result of a deficient beetroot crop, which for a time doubled the price of sugar. The price of the whole world's supply of sugar is, in fact, now dependent on the beetroot crop, which constitutes about two-thirds of the visible production of the world. If there were no bounties and no artificially stimulated production of beetroot sugar this would not be the case. The work of producing sugar would be more evenly distributed, and the supply would not be so dependent as it is now on the crops of one particular region.

The result of all these fluctuations is that the consumer has paid

an average price of 12s. 7d. per cwt. for raw sugar, and 16s. 6d. for refined, while the unfortunate producer, who enjoys no bounty, has had the value of his produce forced down sometimes to 10s., sometimes to 9s., and recently even to 8s. 3d. per cwt.; with the prospect of frequent repetitions of the same process, and absolutely no security for the future.

We have seen what the cost of production is, and that cane sugar can be produced for less than 9s. a cwt. That is, it can be laid down here, at a profit, at 11s., which is 1s. 7d. below the average of these fourteen years of low prices. If cane sugar were free to compete with beetroot on equal terms, and consequently to expand its production under natural conditions, we may feel sure that during the next fourteen years we should have the average price of sugar nearer to 11s. than to 12s. 7d. If that be so, it cannot be said that the abolition of bounties would raise the price to the consumer.

But there is one reservation to be made. The abolition of bounties would raise the margin between raw and refined, perhaps as much as 3d. per cwt., which is the ninth part of a *farthing* a pound. That, I must admit, will be a permanent and inevitable result of the abolition of bounties. Bounties affect price mainly by stimulating production. That is their only effect on price so far as the producer, and practically the consumer, is concerned. But with the refiner it is quite different. The margin between the cost of raw sugar, whether that cost happen to be high or low, and the price of all the products of refining, may be put roughly at from 2s. to 3s. per cwt., according to the kind of raw used and the kind of refined produced, out of which margin the refiner tries to extract a profit of 3d. per cwt. When bounties intervene it is clear that this little profit of 3d. per cwt. can very soon be swept away. That is all that the consumer *permanently* gains by bounties, a ninth part of a farthing a pound, an amount quite inappreciable to him.

Some go so far in the opposite direction as to imagine that bounties have created the jam and confectionery industries, and even that the welfare of those industries depends on the maintenance of bounties. A glance at the rate of increase in the consumption of this country is sufficient to refute such a grotesque idea.

These figures show that during the fourteen years 1872-85, when the average price of refined sugar was 28s. 10d. per cwt., the yearly rate of increase in consumption was 37,038 tons, and that during the following twelve years, 1886-97, when the average price of refined sugar had fallen to 16s. per cwt., the average yearly increase in consumption was only 19,951 tons.

	Raw Sugar.*	Refined Sugar.†	Total Consumption.	Increase or Decrease.	Price of Refined Sugar.	Average Yearly Increase of Con-sumption.	Average Price.
	Tons.	Tons.	Tons.	Tons.	s. d.	Tons.	s. d.
1872........	585,296	88,287	673,583	....	36 4		
'73.........	630,396	109,873	740,269	+ 66,686	33 10		
'74.........	641,272	128,681	769,953	+ 29,684	30 8		
'75.........	740,381	129,733	870,114	+ 100,161	30 4		
'76.........	681,483	129,913	811,396	− 58,718	29 5		
'77.........	751,253	162,761	914,014	+ 102,618	33 9		
'78.........	680,608	154,922	835,530	− 78,484	29 3	37,038	28 10
'79.........	821,682	143,508	965,190	+ 129,660	27 5		
'80.........	786,126	145,542	931,668	− 33,522	29 3		
'81.........	873,360	131,660	1,005,020	+ 73,352	28 11		
'82.........	925,996	131,947	1,057,943	+ 52,923	28 8		
'83.........	975,821	156,902	1,132,723	+ 74,780	27 2		
'84....	892,069	201,989	1,094,058	− 38,665	20 11		
'85.........	899,599	255,475	1,155,074	+ 61,016	18 2		
'86.........	731,071	307,297	1,038,368	−116,706	16 8		
'87.........	841,174	335,242	1,176,416	+ 138,048	15 8		
'88.........	802,146	334,234	1,136,380	− 40,036	17 6		
'89.........	802,938	440,483	1,243,421	+ 107,041	19 8		
'90.........	717,394	472,239	1,189,633	− 53,788	16 4		
'91.........	760,162	555,758	1,315,920	+ 126,287	16 6	19,951	16 —
'92.........	758,331	520,998	1,279,329	− 36,591	17 1		
'93.........	727,842	569,277	1,297,119	+. 17,790	18 4		
'94.........	643,733	690,675	1,334,408	+ 37,289	15 6		
'95.........	790,718	700,160	1,490,878	+ 156,470	13 4		
'96.........	721,262	731,740	1,453,002	− 37,876	13 7		
'97.........	613,706	780,784	1,394,490	− 58,512	12 3		

* Quantities of raw sugar retained for home consumption ; and
† Quantities of imported refined sugar retained for home consumption in the United Kingdom.

If the supposed new industries, using large additional quantities of sugar, were created by bounties, they must, therefore, have been created prior to the period of low prices, 1885-97. They have apparently not even expanded during that period at so rapid a rate as they did when sugar was nearly double the price.

There can be no doubt that sugar enters largely into the production of jams, confectionery, and biscuits, and that these industries have become an important addition to the manufacturing and export trade of the country. But, as I have shown, the abolition of bounties would not deprive them of their cheap and plentiful supply of sugar. In this view I am supported by the confectioners themselves, one eminent firm, writing ten years ago in reference to the sugar Convention then before Parliament, emphatically asserting that in their opinion the effect of such legislation would be " that this kingdom would be provided with

" a larger, a better, a cheaper, and a more reliable supply of sugar
" than it has ever yet had."

I mention this fallacy, and use statistics to explode it, because
it is now the only delusion left which prevents the people of this
country from thoroughly disapproving of the present protection to
foreign producers in British markets.

I have carefully avoided all purely economical arguments and
theories, and confined myself to statistical facts and the inferences
which may be drawn from them. If any discussion to which this
review of the facts may give rise should drift into the regions of
political economy, I hope that aspect of the subject may be deferred
to some future occasion. An examination of the question from
that point of view would be still more interesting, if considered to
be within the scope of this Society, and I should then have great
pleasure in embarking upon it.

Conclusions.

The conclusions to be drawn from this paper appear to be :—

1. That production is stimulated by bounties.

2. That cane sugar can be produced cheaper than beetroot.

3. That the frequent unnatural depressions in value caused by
artificially stimulated over production, though disastrous to pro-
ducers, have on the average conferred no exceptional benefit on
consumers.

4. That cane sugar can be profitably produced and sold in
this country at a price materially lower than the average price of
the last fourteen years of alternate depressions and reactions.

5. That under free and open competition the world would
cease to be dependent on the vicissitudes of the European beet-
root crop.

APPENDICES.

I.

The latest Estimate of the European Bounties on Beetroot Sugar.

The Secretary of the United States' Treasury, after careful and repeated investigation, issued, on the 12th December, 1898, his latest estimate of the bounties.

1. *Austria-Hungary.*—The nominal bounties are 1·50 fl., 1·60 fl., and 2·30 fls. per 100 kilos., on the three qualities of sugar; but as the maximum bounty is fixed at 9 million florins, and as sugar is exported in excess of this amount, a certain amount of bounty has to be returned by the manufacturers at the close of the season.

Taking account of this restitution the United States' Treasury value the net bounty at :—

Fls.			Per Cent.
1·37 per 100 kilos. on sugar polarizing under			93
1·46	,,	from	93 to 99½
2·10	,,	at least....	99½

These bounties are equivalent to :—

Cents.	Frs.	£ s. d.
0·252 per lb. .... 2·88 per 100 kilos.	.... 1 3 4 per ton.
0·268 ,, ... 3·063 ,,	.... 1 5 — ,,
0·386 ,, ... 4·41 ,,	.... 1 15 6 ,,

2. *Germany.*—The fixed bounties are as follows; there is no limit of amount and therefore no deduction :—

Marks.			Per Cent.
2·50 per 100 kilos. on sugar polarizing from			90 to 98
3·55	,,	at least....	99½
3	,,	from	98 to 99½

These bounties are equivalent to :—

Cents.	Frs.	£ s. d.
0·270 per lb. .... 3·086 per 100 kilos.	.... 1 5 — per ton.
0·383 ,, ... 4·377 ,,	.... 1 15 6 ,,
0·324 ,, ... 3·703 ,,	.... 1 10 — ,,

3. *France.*—In the circular of the Secretary of the United States' Treasury, of September, 1897, the French direct bounties of 3·50 frs., 4 frs., and 4·50 frs. per 100 kilos., on raw and refined sugar, were alone recognised. Since then, under date of 10th March, 1898, it was decided to value also the indirect bounty, and to add, therefore, to the above amounts the sums of 5·67 frs., 6·48 frs., and 7·29 frs. per 100 kilos., making total

bounties of 9·17 frs., 10·48 frs., and 11·79 frs. per 100 kilos. These have now been raised to :—

Frs.

10·82 per 100 kilos. of pure sugar, on sugar } 65 to 98 per cent.
    analysing from.................................

11·50 per 100 kilos. on hard dry refined sugar.

11·17   ,,   of pure sugar, on sugar } 98 per cent.
    analysing at least ....

These bounties are equivalent to :—

Cents.		£	s.	d.	
0·951 per lb.	....	4	8	9	per ton.
1·007 ,,	....	4	14	—	,,
0·978 ,,	....	4	11	—	,,

4. *Holland.*—The bounties are estimated at :—

Fls.

2·2354 per 100 kilos. of pure sugar, on sugar } 98 per cent.
    analysing less than...............................

1·7664 per 100 kilos. of pure sugar, on sugar } 98   ,,
    analysing over.................................. ....

0·2946 per 100 kilos. of pure sugar, on all hard dry refined
    sugar whether made from beet or cane.

These bounties are equivalent to :—

Cents.		Frs.			£	s.	
0·408 per lb.	....	4·66 per 100 kilos.	... ...	1	18	per ton.
0·322 ,,	....	3·68 ,,	....	1	10	,,
0·0537 ,,	....	0·613 ,,	....	—	5	,,

5. *Belgium.*—The United States' Treasury has not yet come to any definite conclusion as to the amount of the bounties in Belgium. The preliminary estimate is :—

Frs.

4·50 per 100 kilos. of raw sugar.

5·36   ,,   refined sugar.

These are equivalent to—

Cents.		£	s.	d.	
0·393 per lb.	....	1	16	8	per ton.
0·469 ,,	....	2	3	9	,,

6. *Russia.*—It was only in December, 1898, that the United States' Treasury decided that the Russian system was equivalent to a bounty, and estimated the bounty at—

Roubles.				Per Cent.
0·50 per poud for sugar polarizing at least				99
0·44 ,,		from	....	88 to 99
0·38 ,,		,,	....	75 to 88

These bounties are equivalent to—

Cents.		Frs.			£	s.	d.	
0·727 per lb.	....	8·31 per 100 kilos.	....	3	7	9	per ton.
0·627 ,,	....	7·16 ,,	....	2	18	6	,,
0·542 ,,	....	6·19 ,,	....	2	5	6	,,

These are lower than the real bounty.

7. *Denmark.*—

1·12 crowns per 100 kilos. of refined,

equivalent to—

Cents.	Frs.	£	s.	d.
0·136 per lb.	1·55 per 100 kilos.	–	12	8 per ton.

II.

Yield of Sugar per Acre.

Since this Paper was written, M. Dureau has published, in the " Journal des Fabricants de Sucre" of 26th April, his estimate of the yield of sugar in seven of the European countries for the season 1897-98, which completes my comparison up to date, and fully confirms my estimates.

France has produced in 1897-98	1·350	tons of raw sugar per acre.	
Germany	,,	1·724	,,
Austria	,,	1·100	,,
Russia	,,	0·810	,,
Belgium	,,	1·680	,,
Holland	,,	1·400	,,
Sweden	,,	1·520	,,

The figures for France and Russia were equal to 1·214 and 0·728 tons per acre, but as they are given in refined, while all the others are given in raw, I have reduced them to raw, in the proportion of 9 to 10, in order to make the comparison quite fair. I ought to have made this correction also in my own figures.

M. Dureau then gives what he calculates these figures to indicate as the average yield of the seven countries. Here his figure does not tally so well with my calculation of the average of six countries : it is not so favourable as mine. Reduced to tons per acre it is as follows :—

	1·198	tons per acre in	1897-98
Against	1·240	,,	'96-97
	1·238	,,	'95-96
	1·260	,,	'94-95

With perfect cultivation, he thinks that Europe might attain to 1·6 tons per acre. He then quotes Dr. W. Krüger, of Halle, who resided for many years in Java. Dr. Krüger, in the " Centralblatt," gives the following figures for the whole of Java :—

1897	....	3·440	tons of sugar per acre.
'96	....	3·248	,,

In 1893 there were seven factories which made 4 tons of sugar per acre; in 1897 there were thirty, and many got from 4·526 to 5·22 tons per acre.

M. Dureau concludes by asking—"What will become of the " European sugar industry, if it remains at the ridiculous yield of " 3,000 kilos. of sugar to the hectare?   And is it not evident that " under such conditions, even with its bounties, Europe will not " easily maintain the struggle against such powerful competitors?"

This repeats, in other words, what I say at the conclusion of the chapter on cost of production.   I know many will say—Why then want bounties abolished?   The reply is—Because British producers have a constitutional right to free competition in their own markets.

III.

The German Law of 1896 *and its Practical Effects.*

The German Government has endeavoured, in the law of 1896, to check the excessive increase of production by fixing annually for each factory, according to the amount produced in the preceding years, a quantity of sugar called the "contingent," beyond which the fabricant is not allowed to produce without paying an increased factory tax of 2·50 marks per 100 kilos.   The total of the contingents amounted, for the season 1896-97, to 1,700,000 tons, so that that was practically the limit put to the German crop for that season.   For every new season this total is increased by double the increase in the home consumption between the two preceding years.   Consequently the total was raised to 1,803,252 tons for 1897-98, and 1,889,318 tons for 1898-99.

Undoubtedly this is a check to over production; but curiously enough it has recently operated as an artificial hindrance to reduced production.   When stocks are heavy and prices low the manufacturers would naturally wish to make a temporary reduction in their production; but under this *régime* they dare not do so, as it would involve a reduction in their contingent in future years, when the state of the market might make them desire to return to their former quantity.

There is a small duty levied on the factory working, which amounts on the average to 0·125 mark per 100 kilos.   This and the duty on any excess over the contingent involve, it is contended by the German Government, a reduction of the nominal export bounty of 2·50 marks per 100 kilos. of raw sugar.   I believe the Government calculate that the bounty is reduced to 2·12 marks. The manufacturers put it at 2·275 marks.   Apart from the excess on the contingent, and assuming that the fabricants do not, as I should have supposed, get back the factory tax from the consumer, I find the calculation gives a reduction to 2·3125 marks.

DISCUSSION on MR. MARTINEAU'S PAPER.

SIR ROBERT GIFFEN, K.C.B., said he was sure they had all listened with great pleasure to the paper, and would all regret the unfortunate cause of the absence of the author. Mr. Martineau, although he was identified with the agitation against bounties on sugar, and in favour of countervailing duties, had produced a paper, impartially compiling and arranging the statistical information, which would be very useful to all parties in the subsequent discussions. They must recognise, he thought, that in spite of the impartiality there was an undercurrent of argument all through in favour of the ideas which Mr. Martineau held; but this was perhaps unavoidable, and was in no way a fault. He should speak of the paper accordingly from the point of view of its being a contribution to a study of the facts of the case, and if he criticised on some points, it would be understood that this was without any intention of questioning the fairness of the paper itself. In the table at the beginning of the paper with reference to the production of sugar, the author took as his starting point the years 1871-72, which were both more or less abnormal years in consequence of the war between France and Germany at that time. He did not know how much the production of those years was actually affected by the war. He made this remark without any assertion that the broad statements were in fact affected by beginning with the years 1871-72, but because he noticed that if one took the production of sugar in France in those years the figure was 287,000 tons, which was taken as the starting point; but in the next following year there was a figure of 350,000 tons, which gave quite a different starting point. It would have been desirable, he thought, as a matter of history to go back even as regards production to a year like 1860, so as to show what the fluctuations in the production of sugar were both in France and Germany before the influence of bounties began to be so much felt. It might then appear what were the natural influences at work, apart from the special artificial influence which they were going to discuss. He should be glad if the author would look into this point, and state whether any difference would be made by going back earlier. Next he would ask why the author began a second set of figures in 1884, and assumed that before that time no bounty on production was given in France. The subject was a good deal discussed in the year 1879 before the Committee of the House of Commons, and there was no doubt that the West Indian planters and other people interested in sugar at that time, complained of the bounties in France as if they had an effect in competition with their business. He was quite sure that the French bounties were considered to be by far the most important facts in the discussion at that time; and he was satisfied that the

French bounties, although nominally bounties on refining, were much more calculated to have an effect on production, and that the West Indian planters were quite justified, from their point of view, in objecting to them. He had no doubt that Mr. Martineau would be able to state what the real effect of the French bounty at that time was. At any rate there was room, he thought, to take exception to the assumption which appeared throughout this paper, that though there were bounties on production in Germany before that time, the bounties on production in France only began in 1884 or afterwards, and that it was only after 1884 that the production in that country extended. In all probability there were many causes besides the giving of increased bounties in 1884 which might have affected production, and he thought it was a mistake to put these figures forward and assume that the one cause only in which they were interested made all the difference after that time. Connected with this point was another, which ran all through the paper : the implication that it was the bounties which had been the cause of the increased production of sugar during all those twenty years. It seemed to him, on the very surface of the facts, that this was so extraordinarily bad a business for those people who had been giving the bounties, that he found it quite impossible to believe in the bounties as the sole explanation. Looking at the table of prices on p. 324, it appeared that before 1879, which was the time when the great committee on bounties sat, the price of sugar had not fallen below 20*l.* a ton for raw sugar. Since then the price had been steadily lower almost from year to year, and was now under 10*l.* a ton, so that as far as the producers of sugar in a country like Germany were concerned, the growers were obviously very much worse off than they were before 1879. They were supposed to get a bounty of about 1*l.* 10*s.* to 2*l.* per ton, but the fall of price was 10*l.* per ton and upwards. A gain of 2*l.* on one side, with a loss of 10*l.* on the other side, was not good business. It seemed to him then that there must have been a great deal connected with the production of sugar besides the bounties to enable the German growers, for instance, to go on producing it when it was not bringing them a net income of 20*l.* and upwards per ton as it did before 1879, but only an income of somewhere about 10*l.* per ton, and not more than 12*l.* if the bounty they were receiving was added. The difficulty in these matters for those not specially connected with the sugar trade, was how to make use of the statements which people in the trade put forward. For example he recollected in the same year, 1879 (and the report of the select committee would confirm this statement), that the West Indian planters, through the committee, informed the world that sugar could not be produced at a profit in the West Indies under 19*l.* 10*s.* per ton. The next question he should like to put would be in what way the cost of producing beet sugar was to be ascertained. It might be quite true that the author could give very good estimates of the cost of producing cane sugar, because he understood that one crop of cane sugar after another was grown on the same soil. Beet sugar, however, was one of a course of production, and it

was difficult to state the cost of producing a particular crop, which was only one of two or three in rotation, though it would be possible to tell the cost of producing the three or four crops, of which beet sugar was only one. He hoped the author would give some information upon the point, because it was of the essence of all the statistics with reference to the cost of production, and also with reference to the consideration of the future price of sugar. If it were the interest of the growers of beet sugar to go on producing it, quite irrespective of the special profit or loss which they made on it, for the sake of the other crops in the series, then it might not be so easy to affect the future production of beet sugar by means of countervailing duties or any other method. That was a weak spot in the paper, he believed, and he hoped the author would give some attention to it in the future discussion on the subject. Whilst not wishing to enter on the thorny questions which Mr. Martineau had avoided, he thought some question ought to be put at this stage of the discussion as to how it was known that the effect of countervailing duties would be to abolish the bounties on sugar. Mr. Martineau seemed to take this for granted. It seemed to him, however, that in this complex world, to introduce so great a disturbance as a countervailing duty might not have the effects which those who proposed it were expecting. In the United States they had had countervailing duties for several years, but he did not think that anyone could say that the existence of those duties had had any effect whatever up till now in procuring the abolition of the bounties. How then could it be said that if countervailing duties were made more general they would by that means secure the abolition of the bounties? Two things might happen if countervailing duties were imposed. The price of sugar might be raised in the country which imposed the duty. More money might be given to the producer in the West Indies than to the producer in Germany; for the West Indian would not pay the countervailing duty, though he got the same price in England as the producer from Germany. The duty then would fall on the consumer in England. In that case there was no doubt the West Indian planter would have a great advantage. But this effected nothing towards the abolition of the bounty. The man who produced the sugar under the bounty was just as well off, in the case supposed, as he was before, though the West Indian planter or somebody else was better off. Then take the other case, in which while the price in England was relatively higher than in other countries by the amount of the duty, yet the producer in countries having no bounty was no better off than before, because the price of sugar did not rise generally, and the effect of the countervailing duty was merely to make the producer in the bounty-fed countries so much worse off, so far as it was necessary for him to find a market in the countries which imposed countervailing duties. In the latter case, as a matter of fact, owing to a great variety of circumstances (amongst others to the fact that beet sugar was one of a course of crops), the state of things which would be brought about in that manner might not cause bounties to be abolished. The production of sugar might

go on as it did before, and no good would be done to the West Indian planter or other producers without bounties by the counter-vailing duties. In this case it might be admitted that those who produced sugar under the bounty system were damnified; they did not get so good a price relatively to the West Indian planter and other non-bounty producers as they were doing now; but it was not proved that by that means the abolition of bounties would be secured. Looking at all the evidence he had seen, and the whole history of this matter, which went back thirty years, he must confess that he had the gravest doubts whether any of these confident statements as to what the effect of countervailing duties would be were at all well founded. Without going into all the questions as between free trade and protection which remained behind, he might say he was firmly convinced that countervailing duties would in no way produce the effect which was so confidently anticipated from them, but he believed they would produce new mischief and disturbance.

Sir HENRY NORMAN, G.C.M.G., who was called on by the Chairman, said that he had not intended to speak upon this subject. He had already expressed such opinion as he was able to form after the close of the proceedings of the West India Commission, of which he was chairman, and he had not seen any cause to change that opinion.

Sir NEVILE LUBBOCK, K.C.M.G., wished in the first place to associate himself with what Sir Robert Giffen had said with regard to their regret at the absence of Mr. Martineau. In his absence he proposed to answer some remarks Sir Robert Giffen had made, but he could not help feeling that had the author been present he would have done so much more fully and ably. The first point Sir Robert Giffen had raised was to ask why Mr. Martineau started with the years 1871-72, the years of the Franco-German war. He only spoke from recollection, but he was almost sure that there was very little difference in the production of those two years compared with the two preceding. He could remember perfectly well that in 1866 the whole crop in Europe was only about 600,000 tons. In 1871-72 something like 500,000 tons was accounted for by those two countries, Germany and France, so that there was not room for very much falling off there, even if there might have been a little difference in those years. The next point raised was as to starting the question of the French bounties from 1884, and Sir Robert Giffen mentioned that, prior to that, the West Indian planters had constantly complained that the French bounties were a drawback to their industry. Speaking from recollection, he said that some time prior to 1884 there had been a bounty on the production of refined sugar, but in 1882, or a year or two before, these bounties were abolished. The result was the Frenchmen found their own crop was standing still or going back, while that of Germany was increasing by leaps and bounds, and that they must defend them-selves against the German bounty. Accordingly the French

introduced the law of 1884, which they called the law of salvation,
which gave a huge bounty. It began at about 5*l*. or 6*l*. a ton,
and had varied between 4*l*. and 6*l*. ever since. Hence the reason
for starting with the year 1884, because in that year really the
huge bounty commenced. Then Sir Robert Giffen alluded to
what he called the fallacy of assuming that bounties were the
cause of increased production. It seemed to him that it rather
lay on Sir Robert to show that it was a fallacy, because the whole
object of the paper was to show that as bounties increased so the
production increased, and that as they fell off the production fell
off. When those things happened, constantly varying one with
the other, it seemed fair to say that one was the cause of the
other, or had some strong bearing upon it. Sir Robert Giffen
alluded very fairly to the great difficulty there was in accurately
arriving at the cost of production of beet sugar. He might say
that the same difficulty was met with in the case of cane. He
might, however, give the reason which made him believe that the
cost of beetroot sugar generally speaking in Europe was at least 9*l*.
In these recent years they had had a price in the market of about
9*l*., and no increase in the production. Now if 9*l*. was a profitable
price, experience had proved that there must be increased
production. He believed that 9*l*. a ton was very near the actual
figure. Again, in taking the cost of production of beetroot sugar,
Mr. Martineau had taken the cost of what was known as 88 per
cent. beet, f.o.b. at Hamburg, but if one wanted to compare the
cost of two things brought to the English market, one must add
to that cost at Hamburg the freight to London and the landing
charges. On the other hand, in taking the cost of cane sugar,
Mr. Martineau had again taken the cost of cane f.o.b. in Java or
the West Indies, and in that case again one must add the freight
and landing charges on that sugar before they could be fairly
compared. Further, the cane sugar of whose cost Mr. Martineau
had spoken, was 96 per cent. crystals, worth 1*l*. a ton more than
the 88 per cent. beet with which he had compared it. The task of
arriving at the cost of cane sugar production was complicated by
the fact that the grower also made rum. The practice was to
deduct the price realised by the rum, and to arrive at the cost of
the sugar by dividing the balance of cost by the number of tons
of sugar produced. So some allowance must be made for the fact
that the higher the price of rum, the lower would be the apparent
cost of the sugar. Then Sir Robert Giffen alluded to the fact
that some of them had given evidence before the Committee
of the House of Commons in 1879, and had stated then that
sugar could not be produced under 19*l*. per ton in the West
Indies. That was quite true in 1879, but although they were
accused of being backward, they had largely reduced the cost of
production, and those very estates which could not produce sugar
under 19*l*. then, were now producing it at 8*l*. a ton. He quite
agreed that the cost of production at the present moment was no
test of what it might be ten years hence. He thought science had
really said its last word with regard to the beetroot industry, but
he did not think it had by any means had its last word with

regard to the cane industry. He thought they might still reduce the cost of manufacturing, but on the other hand there were other reasons for thinking that the cost would go up. The price of supplies was likely to be higher than lower and also the cost of labour, but that was a mere matter of personal opinion. Sir Robert Giffen had said that countervailing duties had existed in the United States for some years, but as a fact they had only been in existence for rather less than two years. Still they had produced a very marked effect already. Those duties had given the West Indian producers practically free trade in their sugar as compared with beet in the United States. If the beetroot producer could sell cheaper, well and good, but if he could not, the West Indian planters got the better of him. As a matter of fact the relative price of cane sugar towards beet in the American markets had gone up to the full extent of the countervailing duties, *i.e.*, to the full extent of the lowest duty : they were in point of fact *quâ* beet getting 25*s.* more per ton for cane sugar in the United States market than before the duties were imposed, so that it might be said that so far as countervailing duties in the United States were concerned they had fulfilled every expectation. He was asked whether German sugar had fallen off in export to the United States since the imposition of the duties. The tendency now was, in view of the open market kept here for bounty-fed sugar, for all the beet sugar to be sent here and all the unsubsidised cane sugar to go to the United States, and this tendency was being fulfilled, but the supply of cane sugar had not been sufficient for the whole of the wants of the United States, and hence whenever the cane supply was insufficient they had to turn to the European market. The production of cane sugar could not have been affected by the duties during the short time they had been in operation, and besides the effect of the disturbance in Cuba had been to enormously decrease the supply of cane, whereby beetroot sugar found as large a market in the United States as before, but that could obviously only be so until the cane supply recovered the falling off of recent years. Sir Robert Giffen also said that if countervailing duties were imposed they would not remove bounties and therefore would be of no benefit to the West Indies. He would not find a single beetroot grower in Europe who would agree with him. There was an unanimous consensus of opinion that if we imposed countervailing duties, bounties would be abolished immediately. Moreover, five out of the seven bounty-giving countries had asked us to join in a convention by which we should penalize those countries which might adhere to bounties. The penalty might be either a countervailing duty, which was theoretically the better, or it might be a prohibition, and it should be noticed that though the confectioners and jam makers protested against the duty, they had no objection to prohibition. Finally, he said that the answer to Sir Robert Giffen's question as to how the West Indies would be benefited by the proposed action, was that they would be benefited in this market exactly as they had been by the similar methods which had been applied in the United States.

Mr. C. CZARNIKOW agreed with everything Sir Nevile Lubbock had said.

Mr. HAROLD COX said that although he disagreed with Mr. Martineau's conclusions, he should have been very pleased to have had the opportunity of thanking him personally for the very great amount of valuable information he had collected. With regard to details, the table on p. 327, which showed the growth of our home consumption of sugar, made no reference to the fact of the abolition of the sugar duty in 1874. The table started in 1872, but if 1875, the year following the abolition of the duty, had been taken as the starting point, a very different result would have been shown. On p. 297 Mr. Martineau pointed out that there was a decrease in the production of cane sugar due to the Cuban insurrection. If he had happened to give the figures for the decrease of sugar in Cuba, it would have been seen that apart from Cuba there was an actual increase in the production of cane sugar. Again, on the same page he had made the curious statement that the supply of sugar and its price were governed by the vicissitudes to which the beetroot crop was subject. It was obvious, however, that the price must be affected by the vicissitudes of the cane crop as well as of the beet crop, and two vicissitudes were in such a connection better than one, because they might neutralise one another. Before beet sugar was grown in such large quantities the price of sugar depended on the vicissitudes affecting the cane crop alone—hurricanes and the like—and these were much greater than those affecting beet, which was now produced practically all over Europe. He believed the figures would show that the large production of beet sugar had as a matter of fact steadied the price. On p. 298 Mr. Martineau made a strong point about the effect of German bounties in stimulating a better cultivation of the beetroot itself, so as to increase its saccharine qualities. But that seemed to be an argument in favour of bounties, for it appeared to show that the French growers were too stupid to buy good seed and so get more valuable roots, until their Government pointed out the way by paying a bounty calculated on the saccharine yield of the beet. On p. 307 Mr. Martineau showed that whilst the German bounties came to about 25s. a ton, the French were from 4l. 9s. to 4l. 10s. If bounties were the sole cause of the enormous export of German sugar, how was it that the French export was so much smaller? Take the case of India. France with a bounty of 4l. 10s. was only sending to India 1,200 tons of sugar, whereas Germany with a bounty of only 25s. sent 60,000 tons. This clearly showed that the bounty was not the sole cause of the enormous growth of the German sugar industry. On p. 318 Mr. Martineau said that the rest of the world was now dependent on Germany and Austria alone for more than a quarter of its supply of sugar. We were in no sense dependent on those countries so long as sugar could be grown all over the world. He raised that point because the advocates of countervailing duties were so fond of starting the absurd contention that if we did not put on a countervailing duty at once, Germany and Austria would

go on producing sugar until they killed the industry elsewhere, and then would raise the price. Here were all the countries of Europe putting on bounties one against another and doing all they could to compete with one another, and we were asked to believe that they would suddenly change their policy and combine to force up prices. There were also an increasing number of tropical countries growing cane; was it not ridiculous to suppose that if for any reason the price of sugar went up, that tropical countries would not at once pour in additional supplies? Sir Nevile Lubbock suggested that the change could not take place so suddenly, and that for two years we might be without sugar. He thought they might fairly run that risk. With regard to the cost of the production of sugar, the figures given to the Royal Commission by the colonial company with which Sir Nevile Lubbock was connected, showed that in 1883 the net profit made by the company was considerably less than in 1895, when the cost of production had been reduced by something like a half. In other words, cheap sugar had actually proved more profitable to the company than dear sugar. He noticed with some amusement that Mr. Martineau had proved by a great many figures that cane sugar could be produced in the West Indies and sold here at a profit at 11s. per cwt., but at the same time he stated on another page that the average price within a year or two had been 12s. to 13s. a cwt. If that were so what were Mr. Martineau's friends grumbling about? Let them take this very substantial profit and enjoy it. Lastly, as to the refiners. It might be said that though sugar bounties, according to Mr. Martineau's showing, left West Indian producers with a comfortable margin of profit, yet they did harm to the British refiners. The argument was that there was a steady bounty of 6d. a cwt. against the British refiner. Nevertheless, the number of men employed in the sugar refining industry in Great Britain increased from 4,407 in 1881 to 4,920 in 1891, which was the year of the last census. Since that date the only available test of the prosperity of the industry was furnished by the figures giving the export of British refined sugar. He had taken from the "Statistical Abstract" the figures for the last ten years and divided them into two five-yearly periods. For the period ending 1892 the exports were 38,000 tons, and for the five years ending 1897 they were 50,000 tons. That did not look as if the British sugar refining industries were being ruined.

Mr. P. DE J. GRUT said their West Indian friends seemed for a long period past to have complained that they had not been fairly treated. Yet they had long ago had customs advantages, for he gave an instance of the cost of shipment from the East Indies in the year 1792, when West Indian sugar paid a duty of 15s. a cwt., and that from other sources had to pay 8s. a cwt. more. The speaker then proceeded to discuss the relative cost of sugar production in the West Indies and in Queensland. He thought that in spite of the fact that the West Indies had the more suitable climate and cheaper labour, and were in closer proximity to the great markets of the world, their cost of production was

higher than that of Queensland. He stated that in the most advanced West Indian factories 10 tons of canes were required to produce a ton of sugar. In some it went as high as 15 tons of canes. Yet in some Queensland factories but 7 tons 8 cwt. were used. Though Queensland had the most expensive labour of any sugar producing country, he argued that the perfection of the methods pursued enabled their factories to produce sugar more cheaply than those of the West Indies. He recommended to the West Indies the adoption of the farm system of cultivation, which, in conjunction with modern economical machinery, had helped to cheapen the production of Queensland sugar.

Mr. HENRY DE SMIDT recalled the attention of the speakers to the desire of the author—as expressed in the paper—to keep clear on this occasion of the introduction of economical problems into the discussion.

Mr. C. J. CROSFIELD said he was probably the only sugar refiner in the room, and he should like to say a word or two in reply to Mr. Cox. He would call his attention to the statement which Mr. Martineau had made in his paper about the sugar refiner's position. This he had explained perfectly, pointing out that the difference in the bounties given on raw and refined sugar amounted to about threepence per cwt., which was all the British sugar refiner had to look to in fighting his foreign competitor. He wished to add an expression of deep regret that Mr. Martineau, who knew the question more intimately than anyone in the kingdom, was not present to reply to the criticisms which had been raised that afternoon. Mr. Martineau had written to him that afternoon from his bed, and asked him if he had an opportunity to put an addendum to his paper. It referred to the question of wages in the West Indies, and he had it on the authority of the Bishop of Antigua. In the emancipation time the labourers were promoted to wages and got 9s. to 15s. a week. Now wages have actually been reduced to 1s. 8d. a week, a sum on which it may well be imagined life cannot in all cases be supported. They had been trying to abolish bounties for more than thirty years, and this reduction of wages was the only practical measure that had yet been tried to meet that difficulty.

Mr. R. H. HOOKER asked whether the author could furnish tables showing separately the production of cane and beet sugar during the years covered by the paper, and also the imports of the two sorts into this country, as those two data would be of material interest and greatly facilitate the study of the subject. His main object in rising to speak was however to offer some remarks from a purely statistical point of view upon the table on p. 327, which, so far from showing "at a glance" the deductions drawn by the author, presented in reality a pretty little problem for statistical experts, and was by no means easy to interpret. In the first place, if the table were divided into two periods after 1886 instead of before, the result was totally different; the average annual

increase during the first period became 26,000 tons instead of 37,000, while that of the second was raised from 20,000 to 32,000, indicating a more rapid expansion in late years. The fact that a single year made so large an alteration, at once showed the difficulty of drawing conclusions from the table, and it was accordingly necessary to use great care in dividing it into two parts. The table of areas given on an earlier page showed that the acreage in 1885-86 was exceptionally low in both France and Germany, from which it might be inferred that 1886 belonged to the "ante bounty" period, and that the division should therefore be drawn after 1886. He considered, however, that merely to divide the whole period into two parts could hardly be a true test in any case. A better method would be to divide it into five-year periods. But here again the result was inconclusive, a totally different set of figures being obtained according to whether the successive periods selected were 1872-77, 1877-82, &c., or 1872-76, 1876-81, &c. (the first period in the latter series comprising only four years). As far as he could judge from these quinquennial averages, the increase had in fact been fairly regular, at least since 1876. To take another point, given a certain increase during one period, should we be right in expecting the same rate of increase in the next? It was hardly to be expected that the proportionate increase made on small quantities could be maintained when they became large. Lastly, it was extremely doubtful whether it was correct to compare rates of increases of consumption at different *levels* of prices. Changes in the rate of imports should, he thought, rather be compared with changes in the level of prices. It was not the absolute height or lowness of price that caused changes in consumption. Considering the table from this point of view, and adopting the author's own division between 1885 and 1886, it appeared that the imports increased by 37,000 tons per annum, while prices fell from 36s. to 18s., or by just 18s.; and that they increased by 20,000 tons when prices were falling from 18s. to 12s., or just three times as slowly. Or taking percentages (and it was one of the further difficulties presented by the table to decide whether the actual fall in price or the fall per cent. ought to be used for such a comparison), the fall in the second period was 30 per cent., while in the first it was 50 per cent. From these *à priori* considerations therefore a diminished rate of increase might have been expected, while investigation seemed to show that the former rate of increase had been fully maintained. Thus the table did not prove the author's point; in fact lent support, though in undecided fashion, to the opposite argument. But he (Mr. Hooker) could only repeat that the table was a difficult one to interpret, and he was not satisfied that the foregoing examination was by any means sufficiently thorough.

A hearty vote of thanks to Mr. Martineau for his paper, coupled with an expression of sympathy with him in the unfortunate cause of his absence, was then proposed by the Chairman, and carried unanimously.

Mr. Martineau's Reply.

Since the reading of the paper, an elaborate and lengthy reply has been received from the author. A very much condensed note of this is appended.

He begins by complaining that his friend Sir Robert Giffen contents himself with " grave doubts " and vague surmises, without combatting the facts which had been put forward.

In regard to the choice of the years 1871-72 as a starting point, and to the possible effect of a reduced output in those years through the effect of the Franco-German war, the author argues that, even if it had been so, the fact would have strengthened his point. If France, in spite of reduced production through the war, still produced then 100,000 tons more than Germany; and if, again, in spite of that reduced production, in those years still produced more than in 1884-85, the contrast gains in intensity. But as the figures (expressed in refined) show, the war did *not* reduce the production.

	Tons.		Tons.
1860–61	87,000	1866–67	185,875
'61–62	125,000	'67–68	192,389
'62–63	149,000	'68–69	180,583
'63–64	93,000	'69–70	247,991
'64–65	127,726	'70–71	247,784
'65–66	234,869	'71–72	287,444

Further, if, as suggested, the years 1872-73 had been taken as the starting point, the contrast would again have been more striking.

On the question as to whether or no the French fabricant really had a bounty prior to 1884, the author thinks the explanation given in the paper—that the factories were under excise supervision, and that every ounce of sugar paid duty—is a sufficient confirmation. His intimacy at that time with the Fabricants Committee gave him exceptional opportunity for detecting a hidden bounty, if there had been one. The bounty of which complaint was made before the Select Committee of 1879 was that on refined sugar. It affected the West Indies by so far supplanting West India sugar, which would otherwise have been used for making British refined sugar that had been replaced by French.

Again, in reference to this point, it may be noticed that the French Fabricants Committee gave evidence before the Select Committee of 1879 to show how completely excise supervision could be carried out in France. Had they been getting a bounty themselves, directly or indirectly, they would hardly have been fighting side by side with the British refiners against the granting of a bounty to the French refiners.

Dealing with the suggestion that in all probability there were many causes besides the giving of increased bounties in 1884 which might have affected production, Mr. Martineau calls attention to the facts which he has cited, and which his opponents

in their discussion did not disprove, that the legislative changes which have taken place are remarkably well illustrated by the statistics, and that therefore it lies on the other side to prove that the stimulus was not supplied by the bounties, or at least that some other power, so great as to render the stimulus of bounties negligible, was existent at the same time.

Then in reference to the subject of the "fall" in prices, Sir Robert Giffen asserted that there must have been a great deal connected with the production of sugar besides the bounties, to enable producers to produce for 10s. per cwt. what they formerly got 20s. for. Mr. Martineau replies that he has proved in the paper, that by the encouragement of the bounties Germany has been enabled to improve her methods so that she can now produce at the lower figure, but the bounty enables her to sell at a profit for 9s., what even now costs her 10s. to produce. The urgency of their case forced the cane growers—as the bounties did their rivals—to effect economies and reforms in the methods of production.

If outsiders feel a difficulty in accepting statements made by those connected with the trade, information as to the cost of cultivation may be found in many foreign papers, journals and handbooks. An article dealing exhaustively with the question was written in 1871 by the late Mr. John Algernon Clarke, then Secretary to the Central Chamber of Agriculture, and printed in that Chamber's journal about that time. It is not usual for farmers to produce any crops at a loss for the sake of others in the course of which they may form a part. Nor does it seem that the profit made on wheat growing in Europe is such as to encourage farmers to grow beet at a loss in order to maintain the rotation. But if the "whole course" theory is to be carried out to its logical conclusion, the returns for the whole course must also be lumped together; in which case it is possible that there might be necessity to debit the beetroot crop with the losses on the other crops, which would hardly operate as a stimulus to the production of beetroot sugar. Mr. Martineau explains that his cost of producing beetroot sugar is based, so far as cultivation is concerned, on the market price of the roots, and that as price is an infallible barometer, the price of the roots indicates accurately what they can be grown at. But in this case price is disturbed by bounties, and it may be fairly urged that if it were not for bounties the price of roots would fall. This leads to the inevitable conclusion that the abolition of bounties would reduce the cost of production of beetroot sugar, and gives the strongest argument, from the consumers' point of view, for their immediate suppression.

Mr. Martineau proceeds to deprecate Sir Robert Giffen's reference to countervailing duties as outside the scope of his paper, and as beyond the functions of the Statistical Society. He considered it his duty in the paper to confine himself to statistics, and to avoid economic questions. He asserted his readiness, however, to contribute a further paper, dealing with the matter from an economic point of view. On this point, however, he remarks that the idea of a duty to countervail a bounty originated many

years ago in the international negotiations. The foreign Governments then pointed out that they could not abolish their bounties unless they had security, by a penal clause in the convention, that they would no longer have to contend against the competition of bounties from any other quarter.

If that request had been agreed to by our Government, it is certain that bounties would have been abolished more than twenty years ago. Then Mr. Martineau takes exception to Sir Robert Giffen's statement that " it seems to be taken for granted " by the author of the paper, that countervailing duties would have the effect of abolishing bounties. In the paper Mr. Martineau has carefully avoided the subject, though, of course, his opinions in the matter are well known. The general admission of the principle—already affirmed by the Committee of the House of Commons and by Mr. Chamberlain—will, he urges, be sufficient to obtain a convention. Discussing Sir Robert Giffen's expression of his conviction that countervailing duties would in no way produce the effect which has been so confidently expected from them, but would produce new mischief and disturbance, he challenges the reasoning on which this conclusion is reached. The two cases suggested, where the duty raises the price of other sugar or depresses that of bounty-fed sugar, are really, in Mr. Martineau's opinion, the same.

Regarding the example of the United States, he says things go on as before, provided the supply of cane sugar is adequate. If the American buys beet, he must give at least 1s. 3d. per cwt. less for it than for other sugar; this because 1s. 3d. a cwt. is the lowest bounty, and therefore the lowest countervailing duty. The amount of the German bounty is paid into the United States Treasury, and the German producer cannot be as well off as before. He cannot under these conditions have raised the price by the 1s. 3d. that is to come off. He is shut out of the United States market until he falls to a price less by the amount of his bounty than that of cane sugar. If prices are at the level of the cost of production of beet sugar, the German must sacrifice the whole of his bounty to permit the American to relieve him of his surplus stock. By chance during the last two years there has been a reduction in the visible supply, prices have crept up, and so the pinch of the German producer has been temporarily postponed.

Having given this general answer, Mr. Martineau proceeds to deal with the two specific situations suggested. In the first case the price is supposed to be raised, and so the West Indian producer gets more money—more than the German. It is added that the West Indian does not pay the duty, and that in England he gets the same price as the German, and that then the British consumer pays the duty. But it cannot be that the West Indian at the same time gets the same and a better price than the German. It cannot therefore follow that the British consumer pays the duty, and that the bounty-fed producer is as well off as he was before. The second case was that where, though the price as before is raised in England by the amount of the bounty, the bounty-fed producer gets less than before. The two cases are really identical.

In either, the bounty-fed German must either sacrifice his bounty or stop outside. There is no rise in price. The price in England is the world's price, all sugar without bounty being free to enter.

The continental opinion is that England acted very badly at the Brussels conference. A word from her, even without action on her part, would have caused the suppression of the bounties on refined, and the reduction of those on raw, sugar. Yet she failed to speak then, as she had failed in 1877, when the convention might have been secured. A few years later the request for another conference was met by the refusal of France to consider the matter unless we would agree to a penal clause. Though we did agree to that in 1888, we got frightened afterwards. England, says Mr. Martineau, will not admit the truth so pithily expressed by a very sound political economist in the words, that "a duty to countervail a bounty is not only consistent with free trade, but positively conceived in the interests of free trade."

Turning to the criticisms of other speakers, the author of the paper admits, that if the table of consumption had started with the figures of the year 1875—that following the abolition of the duty—a very different result might have been shown. But the change would have made the comparison more striking. If, as another speaker suggested, the division had been made after 1886, instead of before, the result would have been different. Both these gentlemen seem to have forgotten the assertion of which the fallacy was being exposed. It is supposed generally that the bounties have brought about low prices, and created thereby the industries of the confectioners and jam makers, whose foundation it is thought lies on bounty-fed cheap sugar. By the table of consumption the author showed that during the period of cheap sugar, which began where he drew the line, there has been no extraordinary increase of consumption, and therefore no exceptional creation of sugar-using industries. The objector would like to get rid of a year which showed a falling off of 116,706 tons in consumption, although the price of refined sugar had fallen to the then unprecedented figure of 16s. 8d. per cwt. That year, which it is desired to put in the high-priced years, is, Mr. Martineau urges, the strongest possible demonstration of his point. He is convinced that no alteration in their combinations can in any way affect the significance of the figures.

Putting Cuba on one side, the actual increase in the production of cane between 1892 and 1897 was 252,699 tons. This is, he asserts, quite sufficient to point his moral.

Referring to Mr. Cox's remarks, as to the advantage to the world in having the vicissitudes of the beet crop as well as that of cane to steady the market, Mr. Martineau says two vicissitudes are undoubtedly better than one. But a hurricane makes a very small difference in the world's sugar supply; a bad season in the beetroot districts has frequently made a difference of hundreds of thousands of tons; for we are dependent on a small portion of Europe for the supply of nearly 5,000,000 tons out of a consumption of 7,500,000 tons. Nor did this speaker explain how he arrives

at his conclusion, that the large production of beetroot sugar as a matter of fact steadied the price.

Though a Free Trader, Mr. Martineau cannot refrain from admiring the wonders which the bounty has effected for the beetroot sugar industry, and from eulogising the German Government for the judgment and success with which it has applied its protective system. Germany's start of France is attributed to the fact that she encouraged her people to increase their production at an earlier period, whilst there is also more room for expansion in Germany than in France, and the Germans have shown more aptitude than the French for meeting the wants of the world's markets. The author has never urged that Germany and Austria would desire to kill the industry elsewhere and thus raise the price. Prices are governed by natural laws. But our dependence on those countries for so much of our supplies lays us open to the danger of a great rise in price if anything befall the crops of those two countries. Tropical countries, which now only supply one-third of the world's demand, could not at once pour in supplies, as they are not now in a position to do so. Mr. Cox should remember that a very small disturbance in the balance between supply and demand causes a very large disturbance in price. Then it is asked why there should be a complaint if the average price has been 12s. 7d., while sugar can be laid down at a profit at 11s.? His answer will be found in the table of fluctuations, where it is pointed out that whilst the consumer has paid an average price of 12s. 7d., the unfortunate producer has sometimes had the value of his produce forced down to 10s.—sometimes to 9s.—and recently to 8s. 3d., with the prospect of repetitions of the experience.

The production of British refined has fallen from 800,000 to 600,000 tons per annum. The small quantity exported is no guide; to a certain extent it used to consist of after-products not wanted in British markets. Mr. Hooker's remark, that " it is not the absolute height or lowness of price that causes changes in consumption," is admitted by the author to be a fair inference from the table; but he cannot understand why Mr. Hooker should say that the table does not prove the point in reference to which it is brought forward. He thinks that the explanation offered to Mr. Cox will clear away Mr. Hooker's difficulties in the matter.

The Stability of Gold and Silver Prices in Recent Years.

By Major Leonard Darwin.

THE very valuable papers by Mr. F. J. Atkinson on silver prices in India, published in the *Journal of the Royal Statistical Society for* March, 1897, and June, 1898, have often been quoted as proving that prices have been rising in India for many years. This has led me to make a careful examination of the figures given by Mr. Atkinson with the view of ascertaining for myself what they tend to prove. The following observations are, therefore, almost entirely based on his productions, though my conclusions are not always in accord with his.

The *gold* price of goods is measured by the amount of *gold* which has to be given in exchange for a unit measure of the goods in question; it is, in fact, a measure of the ratio of the value of the goods in question to the value of gold. It is usual to restrict the word "price" to the ratio of the value of goods to the value of the *selected standard of price;* but I have found it convenient to enlarge the meaning of the word so as to make it apply to all comparative values. Thus, by the silver price of any English commodity, I mean a measure of the weight of silver of the same value as a unit of that commodity in England. The iron price, for example, of any commodity is therefore found by dividing the gold price of that commodity by the gold price of iron.

I have used the expression "standard of price" as being preferable to the more familiar phrase "standard of value." A piece of elastic, under a constantly varying strain, sometimes measuring a yard and sometimes a foot, would hardly be accepted as a scientific standard of length; though it might be used, in default of a better, as a standard by which to measure relative length, provided that two measurements could be taken simultaneously. In the same way, gold can only be said to be a standard of relative value, and the term "standard of price" is therefore both shorter and more accurate.

The movement in prices may be regarded as a series of oscillations about a fixed mean. Different causes produce oscillations of different periods, and, if no attempt is made to separate the longer waves from the shorter ripples, we shall very likely arrive at wrong conclusions. Probably, and indeed certainly, some of the movements in prices, which extend over many years, represent

the effect of finite changes in conditions rather than waves.   But, as it is impossible to distinguish these finite movements from oscillations of very long periods, we may conveniently divide the movement of prices into oscillations of long and oscillations of short period.

By taking the average of prices, as recorded during a considerable number of consecutive years, it is obvious that the influence of the oscillations of shorter period will be more or less completely obliterated from the results.   The merits or demerits of silver as a standard of value should be examined in this way, if we desire to investigate the effects of the longer waves in prices separately from the effects of the shorter waves.   It will be as well in the first place only to consider the period before 1893, because, after that date, rupee prices and silver prices began to diverge.   The following figures illustrate the movements in question, Sauerbeck's index numbers being given for comparison:—

Average of Annual Index Numbers.

	Silver Price. Indian Goods (Atkinson).	Gold Price. British Goods (Sauerbeck).	
1863–72	115	101	
'73–82	118	93	
'83–92	119	72	

The above is the comparison as it is usually made, and it is often held to prove the superior stability of silver as a standard of value.   I do not propose to discuss to what extent these index numbers may be considered as truly measuring changes in average prices.   But, putting this question aside, if we wish to determine the relative merits of silver and gold as standards of price, it appears to me obvious that we ought to compare the gold or silver prices of the same thing, not of different things.   If price is but the ratio of the value of the commodity in question to the value of the metal selected as the standard, then we can study the qualities of any metal as a standard of price equally well by considering prices in a country where that metal is not the legal standard as in one where it is.   It is true that the value of a metal is greatly influenced by the demand created by its use in the currency; but its value is nearly as much affected in this way in those countries where it is not used as the standard as in those where it is.   As far as we have yet seen, the change in prices indicated by the foregoing figures may be entirely due to the alterations in the ratio of the value of Indian goods to British goods, and may have nothing to do with the changes directly

affecting the precious metals themselves.   To inquire whether
this is so or not, all four variables must be considered in the
following manner :—

Atkinson's Index Number.   Indian Goods.

	Silver Prices.	Gold Prices.
1863–72	115	115
'73–82	118	105
'83–92	119	89

Sauerbeck's Index Number.   British Goods.

	Silver Prices.	Gold Prices.
1863–72	101	101
'73–82	103	93
'83–92	96	72

Thus, comparing the extreme decennial periods, we see that
silver prices rose about 4 per cent. in India, and fell about 5 per
cent. in England in the mean period of twenty years; whilst
gold prices fell about 22 per cent. in India and 29 per cent. in
England.

There is one error in these figures, which should perhaps be
noticed.   The gold price of Indian goods—the index number in
relation to gold, as Mr. Atkinson calls it—has been found by
multiplying the silver price of Indian goods *in India* by the gold
price of silver *in England;* whereas the gold price of silver *in
India* should have been used as multiplier.   But, with portable
materials like gold and silver, the ratio of their values cannot
differ widely in different localities; the difference of value in two
places cannot vary beyond certain limits, dependent on the cost of
transport, and the cost of transport is small.   The error thus
introduced is not therefore of much importance.

The ratio of the value of gold to the value of a less costly
material, such as wheat, for example, may differ in different
countries to a very considerable extent; for the cost of transport
allows a far wider margin of variation in such cases.   Conse-
quently if the relative value of two such commodities, or the price
of one of them, changes in one country, it does not follow that a
similar change will take place elsewhere.   Assuming that, during
any given period, the labour necessary to produce any class of
goods were to decrease in England, it is not improbable that
people in England would be willing to give more of that class of
goods in exchange for a given quantity of gold at the end, as

compared with what they were giving at the beginning of that
period; that is to say, that it is not improbable that a fall in the
price of the goods in question would take place in these circum-
stances, other things remaining the same. But, if at the same
time no change were to take place in the facility with which
goods were produced in India, there would be no reason for any
increase in the willingness of the people to part with goods for
gold in that country; there would be no reason for a fall in prices.
Thus stationary gold prices might exist in India coincidently with
falling gold prices in England.

But the foregoing arguments apply to silver in the same way
as to gold; and causes affecting commodities generally ought to
affect gold and silver prices alike in the same country, though
they may produce different effects in different countries. It is
possible that the demand for silver and for gold as commodities
may change in the same way in the same country, and in different
ways in different countries; both may, for example, become more
fashionable for ornaments in England and less fashionable in
India. Thus it is also possible that prices as measured by gold
and silver may be affected alike in one country and differently
in different countries, by causes primarily affecting the precious
metals; but such movements in prices would be slow and small,
and may, I think, be neglected.

Thus we ought to be able to analyse the movement of average
prices, as indicated by the foregoing figures, into three separate
movements. (1) Changes due to causes affecting commodities
generally; causes which would, in each country, produce the same
effect on silver prices as on gold prices. (2) Changes due to causes
primarily affecting gold; causes which would affect gold prices in
both countries in very nearly the same way; and (3) Changes due
to causes primarily affecting silver, which would produce a like
effect in both countries on silver prices. Let us assume that
changes in the conditions affecting commodities generally produced
a fall of 8 per cent. in both gold and silver prices in England
between 1863-72 and 1883-92, and that Indian prices were un-
affected by any such changes of conditions. Then, on this
assumption, the outstanding changes in prices, which must be
due to changes in the conditions primarily affecting the precious
metals, would be represented by the following index numbers:—

Atkinson's Index Number for Indian Goods.

	Silver Prices.	Gold Prices.
1863–72	115	115
'83–92	119	89

Sauerbeck's Index Number for British Goods (with the Figures for 1883-92
Increased by 8 *per Cent.*).

	Silver Prices.	Gold Prices.	
1863-72	101	101	
'83-92	104	80	

Thus, as a result of changes in the conditions primarily affecting the precious metals, silver prices would appear, on this supposition, to have risen about 4 per cent. in India and about 3 per cent. in England, and gold prices to have fallen 22 per cent. in India and 21 per cent. in England. The difference between the change in price as measured by the same metal in each of the two countries is easily accounted for by the errors inherent in the system of index numbers; and the foregoing analysis fulfils the necessary conditions with sufficient accuracy.

It will, I think, be generally admitted that during the mean period of twenty years under consideration, the increase in the facility of production and of transport was greater in the case of wholesale goods in the English market than in the case of Indian goods. Hence, according to the foregoing reasoning, we should expect that English goods would have fallen in value as compared with Indian goods; a theoretical conclusion which is confirmed by this analysis. Indeed, had the increase in the facilities for production and transport been the one dominant factor connected with the recent fall in prices—as is often asserted in controversial monometallic literature—I should have expected a considerably greater relative fall in English prices.

Thus the foregoing analysis of the movement of prices is in harmony with our theoretical conclusions. But we cannot assume from this that these figures represent the actual movement in prices due to each separate cause. Whatever movement in prices, due to general causes, we assume to have occurred, provided the movement is selected in such a manner as to show that British goods fell 8 per cent. in value as compared with Indian goods— whether by assuming a greater fall or a smaller rise in British prices as compared with Indian prices—we shall always find that the residual movements due to causes primarily affecting the precious metals will work out in such a manner as to show, as regards each metal, an almost identical change of prices in the two countries; and thus to get results in accordance with theoretical requirements. The reason is that the figures from which these deductions are drawn represent the changes in relative value and not in absolute value; and it is impossible to deduce absolute movements from them. The special causes affecting silver, for

example, may have produced an effect on silver prices far greater than the 4 or 5 per cent. above assumed; but, if that was the case, the general causes not specially affecting the metals must also have produced, in addition to the 8 per cent., an additional change in prices of the same amount, but of opposite sign, to this additional change in prices, arising from causes affecting silver; and thus the two additional movements must have cancelled each other. It may therefore be said that this elaborate analysis does not help us much, for all that can be proved is that English prices fell by 8 per cent. as compared with Indian prices, and that the combined effect of the causes specially affecting the metals and the causes affecting commodities generally has been to produce in both countries less variations in silver prices than in gold prices. We do, however, see the futility of attempting to study the general stability of gold or silver prices, as regards these slow movements, by merely considering the causes affecting the supply and demand of these metals; though *changes* in the causes primarily affecting either precious metal are of the greatest importance as tending to produce *changes* in the level of prices as measured by that metal.

In fact, the main conclusion that we can draw is that, as regards the long period oscillations in prices before 1893, *silver prices were more stable than gold prices; and that British goods fell in value as compared with Indian goods.*

The questions connected with the adoption of a gold standard in India have made the recent movements in prices a matter of special interest. The following figures may, therefore, be worth giving :—

Atkinson's Index Numbers.

	Silver Prices.	Rupee Prices.
1863–69	119	119
'70–76	108	108
'77–83	122	122
'84–90	117	117
'91–97	162	139

In this case seven-year periods have been taken, and the effects of the short period oscillations have not been so much obliterated. But we may conclude that *both silver prices and rupee prices (which were identical before* 1893) *have shown a distinct upward tendency during the seven-year period* 1891-97, *a tendency not previously noticeable.*

If I am right in regarding gold prices as being the ratio of the value of goods to the value of gold, then it follows that

Atkinson's index numbers, gold prices, given on p. 372, illustrate what would have been the movement of prices in India had a gold standard been in force since 1863; that is, on the assumption that the additional demand for gold for India did not raise the value of that metal, as it assuredly would have done, more or less. We see that the fall in prices, even on this assumption, would have been considerable, though not quite so great as in England. It is not my purpose to discuss at length what would have been the economic effects of such a fall. But it may be remarked that, in many industries in England, the increase of production has more or less completely prevented the producer from feeling the strain normally due to a fall in prices; whilst in India the alleviation from this cause would have been much less widely felt. India is mainly agricultural, and the burden of the land tax, until the time for readjustment came, would have pressed more severely on the ryots than it has done; and possibly there might have been agrarian agitation. The military and civil expenditure would also have thrown a greater burden on the country, because the scale of pay would certainly not have fallen in proportion to the rise in the value of money. If gold should rise in value in the future, these are the kind of troubles which India will have to face if a gold standard is adopted. That may be, as I firmly believe it to be, the best alternative practically open to the Government; but it is folly to be blind to its dangers.

Mr. Atkinson makes a great point—rightly, I think—of the effect of rainfall on Indian prices. If the index number of the rainfall is calculated for decennial periods, in the same way that I have done in the case of prices, it would appear from Mr. Atkinson's figures that the rainfall has been increasing in recent years—an increase of 6 per cent. in twenty years. Mr. Atkinson proves that an increase in rainfall is normally accompanied by a fall in prices; and it might perhaps be argued that prices would have risen during this period, instead of being nearly stationary, had this supposed increase of rainfall not taken place. But he warns us distinctly that the figures he gives "are not "strictly accurate as regards comparison of years," the reason being that the number of stations of observation increased "gradually almost year by year." Is it not probable that the more recently added stations have been in more inaccessible places; on the average, higher in altitude; and therefore with a greater average rainfall than the older stations? This would account for the apparent increase. But, whatever the explanation, no meteorologist would accept such a fact without the very strongest proof; and it is almost certain, in considering long

period oscillations of prices, that the influence of rainfall may be entirely neglected.

Passing on to the consideration of the short period oscillations in prices, it is again necessary to remember that there are four variables to be considered : namely, the causes affecting the value (1) of gold, (2) of silver, (3) of the goods in the British index number list, and (4) of the goods in the Indian index number list.

In selecting lists of goods for index numbers, the selection is made with the view of making the list representative of the whole trade of the country in question. It follows that, in the list for a poor country, there should be a greater proportion of goods which may be described as necessaries than in the case of the list for a richer country. A given decrease in the supply of necessaries obviously produces a greater rise in prices than in the case of luxuries, because the demand is more imperative. Hence, other things being the same, we should expect that the index number of a poor country would be subject to greater short period oscillations in prices, produced by temporary changes in economic conditions, than would be the case with the index number of a richer country.

As an answer to the foregoing argument it may perhaps be urged that, according to the quantitative theory of prices, a given decrease in the total volume of goods bought and sold can only produce a proportional rise in average prices, be the country rich or poor. But in arguing from the quantitative theory in this way, it is assumed that the volume of the currency does not change; and this assumption cannot always be made. In times of scarcity in India, silver was formerly, and rupees are still, taken out of hoards and added to the currency, thus tending to raise prices ; and credit money may also increase, through an increase in the amount of property pledged as a security against loans, though this would be more likely to occur in a more advanced country like England. Moreover, the quantitative theory cannot be implicitly relied upon in considering these short period oscillations. In times of famine in India there is, I believe, a large transference of rupees from the hoards of the ryots to the hoards of that "class of men who derive a large profit by holding back " their stocks and demanding high prices." And, although this process can hardly be said to increase the currency, yet, while it lasts, prices may be largely regulated by the pressure necessary to effect this transference, thus for the time making the quantity of money in circulation a matter of less importance. Lastly, according to the quantitative theory, all things bought and sold should be included to obtain a correct average of prices ; which is not the case with the index number lists. Real property, for example,

which is not included in these lists, may, in times of famine, fall more in value in a poor country than in a rich one; thus, in a true average of prices, making up for the greater rise in the price of food.

The probability of the occurrence of short period oscillations in the index number is also affected in another way by the character of the goods comprised within the list; for it is obvious that the larger the area from which these goods are drawn, the less will local influences affect the volume of the supply. Sauerbeck's index number no doubt refers exclusively to goods in the English market; but these goods are *produced* all over the globe. The effect which any change in economic conditions in any one foreign country would have on the price in England of any commodity, if its production were confined to that country, is in fact nearly always lessened or obliterated by the greater stability of conditions in other foreign countries; and even the effect of changes in economic conditions in England itself is greatly lessened in this way. But the list for the Indian index number comprises hardly any goods imported into India. A deficiency of rainfall in India will affect a large number of these commodities, and produce a very marked effect on average prices; and, as the cost of transport in many cases prohibits the importation or movement up country of these goods during times of scarcity, their prices are not steadied by the influence of outside markets. Lastly, the climatic conditions of India are in themselves more unstable than those of England or of many other parts of the world in which the goods in the English markets are produced.

In considering the long period oscillations in prices, the belief was expressed that the conditions of commerce on which production depends were changing more rapidly in England than in India. These changes have been of the nature of a gradual drift all in one direction, all towards increased production. But alterations in economic conditions of this description, which no doubt tend to make prices in England more unstable than prices in India, only affect the long period oscillations in prices; whereas rainfall and all the many other local conditions which tend to produce periods of plenty and scarcity, and good and bad trade, are causes tending to produce shorter oscillations about some fixed mean. This cause producing greater instability of English prices may, therefore, be neglected when dealing with short period oscillations in prices.

Thus, with regard to the causes tending to produce short period oscillations in prices, there are theoretical grounds for believing that existing conditions tend to produce greater oscillations in the index number of Indian prices than in that of British prices; and this

without any reference to the materials chosen as the standards of price in the two cases.

In order to judge of the correctness of this reasoning, it is necessary to obtain some measure of the variability of prices independent of the long period oscillations in prices. For this purpose I have taken a series of averages of the index numbers, both as measured by silver and as measured by gold, for novennial periods, every year being in turn the central year of the period; and I have found the excess *per cent.* of the index number of the central year above the corresponding novennial average. This result I have called the V_9 for the year. If a movement in prices were made up of the combination of oscillations of only two periods; and if the period of the one component oscillation was so long that the curve of prices, if plotted, would appear as a straight line for a period of nine years; and, if the other component oscillation had a period of nine years, then, by plotting the measures of V_9 for successive years, we should simply be drawing the nine-year period curve without any reference to the long period curve. But if, as is sure to be the case, the curve of average prices is made up of oscillations of many periods, all that can be said is that the longer the period of the component oscillation above nine years, the less will its influence be apparent in the results thus obtained; and that we therefore thus get a rough measure of the combined effect of all oscillations not differing widely in period from nine years. The very short period oscillations are obliterated by the fact that yearly means are the basis of the calculations. It is of course questionable if nine years is a good period to have selected. If it is desired to separate oscillations of a given period from all other oscillations, that period should of course be adopted as the basis of the calculation; and my choice was influenced by the true or fancied period of eleven years for variations in the rainfall and for the recurrence of the conditions tending to produce a commercial panic. I selected a somewhat shorter period—a nine-year period —so as to lessen the influence of the long period oscillations on the results. The following is an abstract of the results:—

Value of V_9, or the Excess per Cent. of the Index Number for each Year over the Novennial Average.

Average Result for the Years 1865-88.

	Silver Prices.	Gold Prices.
Indian index number	7·4	7·8
British ,, ...	3·0	3·4

Value of V_9, *or the Excess per Cent. of the Index Number, &c.—Contd.*

Average Result for the Years 1865-71.

	Silver Prices.	Gold Prices.	
Indian index number	6·9	6·5	
British ,, ...	2·3	2·1	

Average Result for the Years 1878-88.

	Silver Prices.	Gold Prices.	
Indian index number	7·4	8·2	
British ,, ...	3·1	3·9	

Thus the silver price of Indian goods—Atkinson's index number—is more variable, judged by this test, than the gold price of British goods—Sauerbeck's index number—in the proportion of 7·4 to 3·4; or, if only the years from 1865 to 1871 are taken into consideration, in the proportion of 6·9 to 2·1. Hence Mr. Atkinson is fully justified in saying that "the fluctuations in "rupee prices were very much greater both before and after the "demonetisation of silver than the fluctuations in gold prices;" that is, if by silver prices is meant the silver price of Indian goods, and by gold prices is meant the gold price of British goods. But can we follow him when he adds that this fact dispels the idea of the "suitability of silver as a measure of value in preference "to gold"?

What we have to consider is whether the greater stability of Sauerbeck's index number as compared with Atkinson's index number has anything, and if so, how much connection with the fact that prices are measured by gold in the former and by silver in the latter.

As regards the long period oscillations in prices, we found that there was a much greater similarity between the movements of prices as measured by the same metal in different countries than between the movements of prices as measured by the different metals in the same country. Here we find the exact opposite is the case. The measure of variability—the V_9—does not differ widely on the average in each country, whether prices are measured by silver or by gold. Gold, it is true, appears to have been slightly the more unstable metal of the two; but this is probably only due to the influence of the long period movement in prices (which have undoubtedly been greater with gold than with silver) not having been completely obliterated by this method of estimating the short period variability. The wide difference is between

Indian prices however measured and British prices however measured. This fact alone justifies the conclusion that the short period oscillations in prices have little connection with the causes primarily affecting the precious metals.

This conclusion may be confirmed by another method of reasoning. Before the year 1873, the variations in the relative value of gold and silver were greatly lessened by the bimetallic legislation of the Latin Union. If the fact that the short period oscillations in prices was greater in India than in England is correlated with the causes primarily affecting the value of silver, it follows that there would have been less difference between the stability of prices in the two countries before 1873 than after that date; because the causes primarily affecting silver which, on this supposition, caused this greater instability, were greatly controlled before that date by the bimetallic tie. By comparing the average results for the period 1865-71 with that for the period 1878-88, it will be seen that though both Indian and British prices were somewhat steadier during the earlier period, probably from causes unconnected with the currency, yet there is nothing to show that the bimetallic tie materially diminished the *relative* instability of Indian prices.

Lastly, if the short period oscillations in the index numbers were largely due to causes affecting one metal independently of the other, we should expect to find many instances when the silver index number was above its novennial average at the same time that the gold index number was below its novennial average. A reference to the table on p. 371 will show (neglecting the cases where either index number coincides with the novennial average) that the gold and silver index numbers of British goods, for the same year, have been both above or both below the novennial mean twenty times, as against only two occasions on which one has been above and the other below; and, as regards the index numbers of Indian goods, that both silver and gold were in every year on the same side of the novennial average. This proves conclusively that the causes producing the short period oscillations in prices are such as primarily affect the value of commodities generally, or else affect both metals alike.

For all these reasons we may therefore conclude that the great variability of Indian prices for short periods has nothing to do with the fact that silver is, or rather was, the standard of price.

It may be interesting to inquire as to the exact nature of the causes which produce these short period oscillations in prices in India and in England. As to India, Mr. Atkinson has clearly established an intimate connection between rainfall and prices. In order to verify this conclusion, I have worked out the measure

of variability—the V_9—for the rainfall; and, if the results as given on p. 371 may be taken as representing a true average, it follows that if the rainfall *of the preceding year* is above the corresponding novennial average, the chances are 17 to 5 that silver and gold prices will be below their novennial average. This gives ample confirmation of Mr. Atkinson's conclusion, *that Indian prices are greatly influenced by the rainfall.*

Everyone admits that scarcity will affect prices; but the exact way in which it does so is often not clearly appreciated. A famine will alter the way in which goods exchange one for the other. At such times people are more willing than usual to part with silver, and less willing to part with food supplies; that is to say, that the quantity of food exchangeable for a given quantity of silver is below the average; and this is one main cause of such a rise in the price of the necessaries of life. But this is entirely due to the nature of the particular commodity which happens to be chosen as the standard of price. Using the word price in the larger sense which I have given it, there will be a rise in times of scarcity of average prices, as measured by some commodities, and a fall, as measured by others. If, for example, Orissa rice had been accepted as the standard of price for any purpose in India in the year 1878, when silver prices rose 24 per cent. *above* their novennial average, then the amount of this standard of price necessary to purchase a fixed amount of commodities, taking an average, would at that time have been 25 per cent. *below* its novennial average. The level of prices is merely a question of relative exchangeability; and, as gold and silver are somewhat similar in economic characteristics, their exchangeability against other commodities is affected in much the same way by a scarcity of food supply. Hence famine causes gold prices and silver prices both to rise alike in India, though gold is not the standard of price; a theoretical conclusion which is confirmed by the foregoing figures.

Rainfall is therefore, at all events, one of the most important of the causes producing short period oscillations in prices in India, however they are measured. Climatic causes, however, produce comparatively little effect on British prices, and, in studying the changes in Sauerbeck's index numbers, we must search for other explanations. Commercial confidence is generally said to be one of the most important factors in regulating wholesale prices in highly civilised countries; and, if we include in that term all the complex conditions which produce oscillations in the rate of interest, or in the value of the use of money, it can be proved that this is the case. By reference to Col. 8 of the table on p. 371, it will be seen that if these figures are accepted as a true average, the chances are 20 to 4 that average gold prices in England will

be above their novennial average when the rate of discount is above its novennial average. Nearly the same result is obtained if average silver prices in England are substituted for average gold prices. Here again we have a case of an alteration in relative exchangeability. In times of commercial activity, when people are clamorous for the use of money, interest on loans will rule high. At such times the demand for commodities is generally very keen; whilst the demand for the commodities silver and gold may not be above the average. As compared with average commodities, people will be more willing to part with their silver and gold—that is to say, silver and gold prices will rise.

As I have almost neglected the consideration of the effect which the adoption of a particular metal as the standard of price has on prices as measured by that standard, it may perhaps be said that the foregoing discussion must be very defective. I do not see how the selection of any substances as the legal *standard of price* can have any effect on prices as measured by that standard; though no doubt its use as the *medium of exchange* is very important, and must be considered; for that use affects its demand, and therefore its value. The slow divergence between silver and gold prices in recent years has, I believe, been largely due to this cause. But here we are considering short period oscillations in prices. With an increase of commercial confidence, the volume of credit on a given metallic foundation increases largely; and this is a force tending to diminish the demand for gold; to lower its value; and to *raise* prices generally as measured by gold, *including the gold price of silver.* But at such times the demand for money increases; and this increases the demand for gold to serve as a basis for the currency. Here, then, is a force tending to increase the value of gold; *to lower gold prices, including the gold price of silver.* Now if these two forces approximately balance each other —that is to say, if an increase of confidence tends to call forth approximately the right additional amount of credit money, to enable the increased business to be carried on on the same metallic foundation and in the same manner as heretofore—then the short period oscillations in gold prices due to changes in confidence will be little influenced by the fact that gold is the currency material. And it appears to me probable that these forces do approximately balance each other, for the following reason. We should expect to find that the values of gold and of silver, *as mere commodities,* were affected in about the same degree by changes in commercial confidence, because of their economic similarity. Facts prove that their values do vary nearly alike as regards these short period oscillations; and we may fairly conclude that the special forces which are brought into play at such times, and which tend to produce

changes in the value of gold but not of silver—those due to the fact that gold is the currency material—largely neutralise each other, and produce no resultant force. The facts may be accounted for in other ways, but this appears to me the most probable explanation.

Gold and silver prices are usually both above their novennial average at the same time. If the true explanation of this fact is to be found in the demand for these two metals, as commodities, not increasing as much as the demand for commodities generally when prices are rising, then we ought to be able to find some substance, the demand for which increases as much or more than the average at such times; for all things cannot be low as compared with their average. The demand for iron appears likely to act in this way; for it increases largely in times of commercial prosperity. If the ratio of the price of commodities in Sauerbeck's list to the price of iron—the index number of average iron prices— is calculated for each year; and if the measure of variability (V_9) of these iron index numbers is calculated as before; then it will be seen that, if the gold index number is *above* its novennial mean, the chances are 11 to 1 that the iron index number will be *below* its novennial mean. Gold prices tend to rise when iron prices tend to fall. This fact gives a kind of confirmation to the foregoing arguments.

The index number is intended to be a measure of the exchangeability of the standard of price against commodities generally: that is, a measure of the value of the standard of price. In this respect these index numbers are very imperfect; for whole classes of goods are omitted. But we may I think conclude from the figures given in the table that, as regards *oscillations in prices not widely removed from nine years in period, an increase in the value of the use of money will in England normally be accompanied by a decrease in the value of gold, or a rise in gold prices, and by an increase in the value of other substances, such for example as iron.*

No doubt a low rate of interest does tend to stimulate trade, and thus to raise prices; and it might therefore be expected that periods of low discounts would be periods of high prices. If novennial means form the basis of the comparison, this, we have seen, is not the case; though it might prove true with regard to oscillations of much shorter period; but of this I have no means of judging. It is probable, moreover, that the demand for gold as a commodity is but slowly affected by changes in its value; that is to say that the use of gold as an article of merchandise does not tend to quickly regulate its value, or the value of the credit money based upon it. If this is the case, the foregoing arguments are not applicable to very short period oscillations in prices; for

they are founded on the conception that prices are regulated by the ratio of the value of commodities generally to the value of the one selected commodity, gold. But this again I have not been able to investigate.

It appears, therefore, as far as I have been able to study the question, that an increase of commercial confidence produces a rise in prices as measured by some standards of prices, and a fall in prices as measured by others. If the selected standard is one which tends to raise prices when trade is increasing, and to depress them when trade is declining, the oscillations in trade will obviously be more violent than if the reverse was the case. Something may, perhaps, be said on the other side, but I cannot doubt that the standard selected should be one tending, as far as possible, to produce commercial stability; that is, to stimulate trade when it is sluggish, even if it checks it when it is progressive. From this point of view, gold and silver are some of the worst commodities that could be selected *as standards of price*. The point is, however, one of purely academical interest; for either metal, *as a medium of exchange*, is quite unrivalled by any other commodity; and this merit counterbalances their defects as standards of price. This consideration does, however, show how senseless is the blind worship of the gold standard.

Thus a study of the figures given by Mr. Atkinson shows that the short period oscillations of the Indian index number are to a great extent correlated with Indian local circumstances, such as rainfall; whilst the oscillations of the British index number are correlated with commercial confidence, and probably with other circumstances affecting England more than India. We also find that these oscillations are not correlated with the demand or the supply of either precious metal; but are dependent on other more or less independently variable conditions; and that these variations in prices have been greater in India than in England. Hence the foregoing investigation of facts confirms the theoretical conclusion that, *as regards short period oscillations, prices in India will always be more unstable than prices in England, whatever be the standard of price.*

There are some considerations which would lead us to expect that there would be a well marked connection between the variations in the British and in the Indian index number, if measured by the same standard of price. The difference between the rates at which gold is exchangeable for any commodity—that is, its gold price—in different countries is confined within limits dependent on the cost of transport of that commodity; for when the commodity in question is imported from one country to the other, the cost of the transportation may be divided in any way

between the two countries, but must be paid for by the two together. If the gold price of a commodity in one country tends to vary beyond these limits, it must, as it were, drag the gold price in the other country along with it to a certain extent. Thus at first sight we should expect that the price of goods included in the international trade between two countries would vary in much the same way in both places; and, as all other goods are sympathetically affected by the movement in price of the international goods, that the index numbers in India and in England would oscillate somewhat similarly. The foregoing theoretical conclusion is, however, completely falsified by the facts in a way which, I confess, surprises me.

The relative variations in prices can be tested in two ways. If Indian goods varied in gold price in the same way as British goods, it is evident, neglecting the question of the cost of transport, that the same amount of Indian goods would always be exchangeable for a given quantity of British goods; or the British goods price of Indian goods would not vary. But as a fact the British goods price of Indian goods varies even more than the silver price of Indian goods. Then again, if the forces tending to make the Indian and the British index numbers vary alike had any marked effect, we should at all events expect to find that the Indian index number tended to increase whenever the British index number is increasing, the standard being the same; whereas, taking the years 1865 to 1888 as a guide, when silver prices in India are *above* their novennial average, the chances are 13 to 9 that silver prices in England will be *below* their novennial average; and, as to gold prices, the chances are even which way it will be.

These facts seem to me to lead to one or both of the following conclusions : (1) Either that foreign markets affect the prices of exports very slowly, and that the readjustment of the cost of transport between the two countries—that is, the variations in the inward and outward freights—allows in many cases a considerable variation between the prices of the same commodity in India and in England; (2) or, if the foreign markets do have much effect on the price of exports and imports, that the goods not included in the international trade are but very slowly affected by the changes in the prices of exports and imports.

Both these explanations are probably true; but a study of the figures given by Mr. Atkinson leads me to the conclusion that there is more truth in the first than in the second.

It follows from the facts just mentioned that if silver prices are rising in India, the chances are slightly in favour of silver prices falling at the same time in England. If the figures given in the table on p. 372 are examined by another method, the details of which I

have not thought it worth recording, it can, I think, be shown that the chances are also somewhat in favour of *gold* prices falling in England at the same time that *silver* prices in India are rising. The causes primarily affecting the precious metals did no doubt produce a heavy fall in the price of silver between 1873 and 1893, and it is often asserted that the fall in gold prices in England should, in part at least, be traced directly to this fall in the exchange. If the fall in gold prices was due to causes primarily affecting gold, we do not need the trade with silver-using countries to explain that fall. I can therefore only interpret this assertion to mean that the gold price of English goods is in some way influenced by the silver prices of goods in India, and influenced in such a way that a rise in silver prices, due to causes primarily affecting silver, will produce a fall in gold prices, and *vice versâ*. At first sight it would appear that those who hold these views might point to the foregoing facts as a confirmation—though but a feeble one—of their opinions. It must, however, be remembered that a rise in prices from causes primarily affecting the currency is a very different thing from a rise in prices due to a deficiency of supply, which appears to be the chief cause of the short period oscillations of Indian prices. The one increases trade and stimulates exports ; the other checks production and diminishes exports. Hence I do not think that these somewhat uncertain generalisations as to these short period oscillations in price can be quoted as having a bearing on the suggested effect of Indian currency conditions on British prices.

The only explanation which I can suggest of this tendency for Indian and British prices to move in opposite directions—if it really exist—has nothing to do with the currency. The rise in prices in India, due to deficient harvests, will be accompanied by a decrease of exports, and consequently by a decrease of imports. The decrease of exports from and imports to England, thus occasioned, would ultimately, according to the quantitative theory of prices, be accompanied by a slight rise in prices in England. But the more immediate result would be to raise the price of some goods in England—namely, of those of which the supply would thus be diminished, and to lower the price of others—namely, of those of which the demand for export to India would be diminished. The total effect on prices would depend on the way in which these two classes of goods were affected. If a very slight rise in prices was sufficient to attract sufficient additional food supplies from other countries to make up for the shortage from India ; and if the demand in other countries for the goods usually exported to India was not sufficiently elastic to prevent the falling off in the demand from causing a considerable fall in

prices; then the net result of the rise in prices in India, due to scarcity, would be to cause a fall in average prices in England. The foregoing is, I believe, a true cause tending to produce an opposite movement in British and Indian prices in these circumstances; though I confess I should have thought that the result would have been hardly appreciable.

Another deduction with reference to the bimetallic controversy may perhaps be made from the foregoing figures, though it is of a highly speculative character. Had the relative values of gold and silver been fixed by effective bimetallic legislation, it is evident that silver prices and gold prices would have altered in the same way in the same country, no matter what material was adopted as the standard of price. But this does not enable us to say what would have been the exact level at which bimetallic prices would have stood at any particular place and time on this assumption. We may however, I believe, get a first rough approximation to the truth by taking the mean between average prices as actually measured by gold, and as actually measured by silver, and by assuming that we thus get an index number of what bimetallic prices would have been had bimetallism been effectively maintained. By comparing the record of prices of the decennial period 1863-72 with that of 1883-92, it will be seen that the average price of British goods (Sauerbeck's list) fell 29 per cent. as measured by gold, and 5 per cent. as measured by silver, in this mean period of twenty years; and that, comparing the same periods, Indian prices (Atkinson's list), fell 22 per cent. as measured by gold, and rose 4 per cent. as measured by silver. To estimate the probable movement in bimetallic prices in each case, we take the mean. Thus bimetallic prices would have fallen 17 per cent. in England, as compared with a fall in gold prices of 29 per cent.; and bimetallic prices in India would have fallen 9 per cent., as compared with a rise in silver prices of 4 per cent.

It is, however, with short period oscillations that we are at present chiefly concerned. On the foregoing assumption as to the level of bimetallic prices, the measure of variability—the V_9—would be found for each year by taking the mean between the actually recorded V_9 for silver prices and the V_9 for gold prices for that year. Making these calculations, we find:—

	British Goods.	Indian Goods.
Average values of V_9 for the years 1878-88 inclusive—		
Gold prices....................................	3·9	8·2
Silver „	3·1	7·4
Average of the mean between the value of V_9 as recorded in silver and as recorded in gold for each year....................................	3·2	7·8

The lowest row of figures, therefore, represents the measure of the variability of bimetallic prices; and we see that prices in England would have been slightly more stable, and prices in India slightly more unstable, under a bimetallic system.

The deductions from such speculative reasoning must not, however, be too nice. *All we can say is that, had an effective bimetallic system been in force since 1873, it is probable, as regards the slow movements, that the price of British wholesale goods would have been decidedly more stable, and that the price of Indian goods would possibly have been somewhat more unstable; whilst, as regards shorter period oscillations in prices, it cannot be proved that bimetallism would have had any steadying effect whatever.*

Those who are desirous of opening the Indian mints to the free coinage of silver appear to believe that, even without bimetallic legislation, gold and silver will in time gradually assume their "natural relative value;" and that the gold price of silver, and, consequently, the rate of exchange between gold and silver using countries, will remain approximately steady at or near some fixed point. But it is questionable whether these metals have any even approximately fixed "natural relative value." In the foregoing discussions, I have endeavoured to prove that price should be regarded as the ratio of the value of one selected commodity to the value of other things. If this view is accepted, we may perhaps learn something by inquiring whether commodities, other than the precious metals, have natural relative values. Probably those metals, which have long been known to the world, are the commodities most suited for such a comparison; and in the following diagram I have indicated the changes which have taken place in recent years in the copper price of iron, the tin price of iron, the lead price of iron, the tin price of copper, the copper price of lead, and the tin price of lead; and, for comparison, the gold price of silver. It is obvious that if the gold price of silver shows a fall, the silver price of gold will show a rise; one way or other of pairing two metals must, if there is any change in relative value, show a fall in prices; and the metals have in each case been paired in that way. The diagram proves conclusively that these metals have no natural relative value to which they have drifted, even after all these centuries of unfettered competition. Why should we expect the relative value of gold and silver to be any more stable? It is probably true that the relative demand for the precious metals for use in the arts is more stable than the relative demand for other metals; which makes the short period oscillations in the gold price of silver less marked than is the case with the other prices. But the demand for gold and silver for currency purposes introduces a variable element which does not affect the

prices of the other metals. And, as to the supply, modern improvements may affect the production of the precious as much as

Diagram illustrating the Changes in the Relative Value of Various Metals.

Tin price of copper (1).
Tin price of iron (2).
Lead price of iron (3).
Tin price of lead (4).
Copper price of iron (5).
Copper price of lead (6).

Gold price of silver (7).

The ordinates represent the ratio of Sauerbeck's index numbers for the metals in question.

that of the non-precious metals; except that, being less bulky, the changes in the cost of transport would influence them less. No doubt it is exceedingly difficult to estimate the combined effect of

all these influences on prices. No doubt, also, it is true that legislation in recent years has affected the value of gold and silver to a greater extent than is likely to be the case in future. But the study of this diagram does nevertheless confirm my belief that, *as long as the world remains under monometallic conditions, we must look forward to wide and constant, though slow, changes in the relative value of gold and silver, producing corresponding movements in the rates of exchange between gold and silver using countries.*

The last point I wish to touch on is the volume of the currency. Mr. Atkinson claims that his figures afford "a peculiar proof of " the quantitative theory, and show that the continuous inflat- " ing of the currency has had a marked effect in raising prices." According to his diagram, there was, no doubt, a great similarity between the rate of the increase of the currency and the rate of the rise in prices, between the years 1881 and 1892. But the volume of the currency is certainly not subject to short period oscillations; and to judge what connection there is between these two variables, we ought to take averages extending over periods of some years, rather than trust to coincidences between the curvatures for comparatively short periods.

Average of Atkinson's Index Numbers.

	Currency.	Prices.
1864–71	100 ⎫ 103	118 ⎫ 119
'72–79	105 ⎭	120 ⎭
'80–87	124 ⎫ 133	110 ⎫ 120
'88–95	142 ⎭	129 ⎭

It is difficult to trace any connection between these figures; for there appears to have been little or no rise in prices on the average, if the period 1864-79 is compared with the period 1880-95; that is during a period when the currency increased about 30 per cent.

The foregoing results do not prove that the quantitative theory is wrong; for, with that theory, it is always assumed that other things remain the same. Many things were changing during the mean period of sixteen years included in the above comparison. More and more transactions, which, at the beginning of the period, were accomplished in some primitive manner, at the end of the period may have required the direct or indirect employment of coin; and it is possible, and I think probable, that the increase in the currency in these years merely satisfied these

new wants, without therefore necessarily being accompanied by a rise in prices.

These conclusions have a direct bearing on the question whether the rate of exchange between England and India can be maintained without any further action on the part of the Government. If it is true that the increasing use of coin is such an important factor in the matter, then, if such an increase goes on, we may fairly anticipate that there will soon be a demand for gold for the Indian currency, provided that there is no further issue of other kinds of currency; and that in these circumstances a gold standard will be automatically established before long. To attract gold to India, Indian prices must tend to fall relatively to British prices. If prices were nearly stationary with such a great increase of the currency, probably they would tend to fall, if the volume of the currency was not increased, *though we have seen no sign of it yet.* It is also to be observed that prices fell about 9 per cent. between 1872-79 and 1880-87, though the currency increased about 18 per cent.; thus proving that there are other elements of great importance besides the quantity of currency to be considered in estimating future prices. If the currency is not further restricted, it appears to me, therefore, that stationary or rising prices must for some time to come be regarded as a *possible* event; and, as we cannot rely on prices rising more rapidly in England than in India, *we cannot be certain that, under existing conditions, the present rate of exchange will be maintained in the immediate future, though it is highly probable that that will be the case.*

In this paper I have drawn all the conclusions which appear to me to be deducible from the figures given by Mr. Atkinson. Various points have been dealt with. But the most important general conclusion is, I think, that *in studying or in prophesying changes in the level of prices, we should, as regards long period oscillations, look mainly though not wholly to the causes primarily affecting the precious metals; whereas these causes may be almost entirely neglected when considering oscillations in prices of shorter period. Oscillations in prices of only a few weeks or months have not been investigated.*

Value of V_9, *or the Percentage Excess of the Index Number for each Year over the corresponding Novennial Average.*

	1	2	3	4	5	6	7	8
	British Goods.			Indian Goods.			Indian Rainfall.	Rate of Discount in England.
	Gold Price.	Silver Price.	Iron Price.	Gold Price.	Silver Price.	British Goods Price.		
								£
1865	+ 0·3	+ 0·2	− 11·0	+ 2·4	+ 2·3	+ 2	− 0·1	+ 0·42
'66	+ 1·5	+ 1·2	− 1·6	+ 14·9	+ 14·5	+ 14	− 5·2	+ 2·28
'67	− 0·4	± 0	+ 5·9	+ 7·9	+ 8·4	+ 9	+ 8·5	− 1·61
'68	− 2·1	− 1·8	+ 16·2	− 2·4	− 2·1	± 0	− 15·1	− 2·02
'69	− 3·6	− 3·8	+ 11·5	+ 8·0	+ 8·8	+ 12	+ 1·4	− 0·62
1870	− 5·7	− 6·3	+ 3·4	− 0·1	− 0·6	+ 4	+ 3·7	− 0·61
'71	− 1·2	− 2·7	+ 6·5	− 9·8	− 11·1	− 9	± 0	− 0·41
'72	+ 8·3	+ 5·6	− 18·6	− 2·5	− 4·8	− 9	+ 6·4	+ 0·80
'73	+ 10·9	+ 8·8	− 26·3	− 3·5	− 5·4	− 13	− 7·8	+ 1·40
'74	+ 3·2	+ 1·5	− 17·7	+ 2·6	+ 0·5	− 1	+ 7·0	+ 0·24
'75	− 1·4	− 2·2	− 6·0	− 11·3	− 12·4	− 12	+ 8·1	− 0·16
'76	− 1·1	+ 4·0	+ 6·9	− 14·3	− 10·5	− 14	− 12·6	− 0·77
'77	+ 0·6	± 0	+ 8·8	+ 16·6	+ 15·3	+ 15	− 9·9	− 0·41
'78	− 3·7	− 1·8	+ 16·9	+ 21·0	+ 24·0	+ 26	+ 12·3	+ 0·55
'79	− 5·9	− 3·1	+ 4·6	+ 11·0	+ 14·1	+ 18	+ 3·8	− 0·70
1880	+ 2·3	+ 1·9	− 7·8	− 1·8	− 2·1	− 4	− 6·8	− 0·42
'81	+ 1·9	+ 1·7	+ 2·9	− 11·8	− 11·9	− 13	− 0·5	+ 0·28
'82	+ 4·2	+ 2·0	− 7·1	− 8·5	− 10·3	− 12	− 0·6	+ 0·89
'83	+ 4·5	+ 2·7	− 0·9	− 4·4	− 6·2	− 9	− 1·0	+ 0·38
'84	− 1·4	− 5·2	+ 3·7	+ 6·8	+ 2·5	+ 8	+ 0·4	− 0·33
'85	− 4·4	− 6·4	+ 4·4	+ 3·2	+ 0·8	+ 7	+ 0·6	− 0·48
'86	− 6·5	− 2·9	+ 8·3	− 7·1	− 3·7	− 1	+ 3·8	− 0·43
'87	− 6·2	− 2·4	+ 7·2	− 8·5	− 4·9	− 3	+ 2·9	− 0·03
'88	− 1·4	+ 3·8	+ 6·2	− 6·3	− 1·3	− 6	− 4·4	+ 0·15

Note.—In Col. 8 the *actual* (and not the *percentage*) excess of the rate of discount over the novennial average is given.

Index Number of the Prices of British and Indian Goods.

	British Goods.		Indian Goods.	
	Gold Price.	Silver Price.	Gold Price.	Silver Price.
	*	†	‡	§
1861	98	98	99	99
'62	101	100	100	99
'63	103	102	105	104
'64	105	104	113	112
'65	101	101	117	117
'66	102	102	134	133
'67	100	100	126	126
'68	99	99	114	114
'69	98	98	126	126
1870	96	96	115	115
'71	100	100	100	100
'72	109	110	104	105
'73	111	114	104	107
'74	102	107	111	116
'75	96	103	96	103
'76	95	110	93	107
'77	94	104	125	138
'78	87	101	128	148
'79	83	99	114	135
1880	88	102	101	117
'81	85	100	90	106
'82	84	99	89	105
'83	82	99	88	106
'84	76	91	95	114
'85	72	90	90	113
'86	69	93	82	110
'87	68	93	81	111
'88	70	99	84	119
'89	72	103	88	125
1890	72	92	98	125
'91	72	97	94	127
'92	68	104	92	141
'93	68	116	89	151
'94	63	132	75	158
'95	62	127	73	149

* Sauerbeck's index numbers.

† Found by dividing the figures in the first column by the gold price of silver, as given in Col. 10, p. 92, *Journal of the Royal Statistical Society*, March, 1897.

‡ Col. 7, p. 92, *Journal of the Royal Statistical Society*, March, 1897, Atkinson's "Index Number in relation to Gold."

§ Ibid., Col. 6. Atkinson's "Index Number in relation to Silver."

MISCELLANEA.

CONTENTS:

I.—*On the Representation of Statistics by Mathematical Formulæ*— continued. (Part III.) By Professor F. Y. Edgeworth, M.A., D.C.L.

The relation of this third part to the preceding two is thus to be conceived: Whereas the whole is designed to recommend formulæ which have some affinity to the normal law of error, as being specially suited to represent statistics of frequency, in the first two parts the connection is supposed to be a close one, a strict deduction from a probable hypothesis; in the third part the connection is less close, the descent of the proposed formula from the law of error is not so satisfactorily evidenced—sometimes only presumed from a certain general resemblance.

The appearance without the proof of affinity which is the characteristic of this section, is illustrated by the following extreme instance. Let us construct a *composite probability-curve,* consisting of two half-probability[1] curves of different types, tacked together at the *mode,* or greatest ordinate, of each, so as to form a continuous whole, as in the accompanying figure, where the line

[1] It will be observed that the following construction is not much indebted to the "half-Galtonian" curve employed by Professor De Vries (in the *Berichte*

OP is the maximum ordinate, the curve PQ extending from P to infinity in a positive direction is (half of) a probability-curve, viz.,

$$y_1 = \frac{a}{\sqrt{\pi} c_1} e^{-\frac{x^2}{c_1^2}},$$

and similarly the curve PR is (half of) a probability-curve, viz.,

$$y_2 = \frac{\beta}{\sqrt{\pi} c_2} e^{-\frac{x^2}{c_2^2}};$$

c_1 and c_2 are the respective *moduli*; $a + \beta = 1$.

The constants proper to this construction may be determined thus, when there are given the centre of gravity and the second and third *moments*, or mean powers, of the observations about the centre of gravity, say μ_2 and μ_3. Put x' as the distance of the centre of gravity from the mode, the centre of gravity (the distance of G from O in the figure). Then to determine x', c_1, c_2, a, and β, we have the following equations :—[2]

$$x'^3 (\pi - 3) - \mu_2 x' + \mu_3 = 0$$
$$c_1 - c_2 = \sqrt{\pi} x'$$
$$c_1 + c_2 = [8\mu_2 - x'^2 (3\pi - 8)]^{\frac{1}{2}}$$
$$a = c_1 \div (c_1 + c_2), \ \beta = c_2 \div (c_1 + c_2).$$

For example, in the statistics for barometric heights at Babba-combe, already treated by other methods,[3] we have $\mu_2 = 10\cdot9012$, $\mu_3 = 13\cdot0321$. Whence for x' I obtain the equation $x^3 - 76\cdot99$ $x' + 92\cdot041 = 0$; of which the appropriate solution is $x = 1\cdot219$. Whence I find $c_1 = 5\cdot692$, $c_2 = 3\cdot532$. The composite curve is thus completely determined; and the way is open to calculate the number of observations in each of the given intervals. Thus on the positive (right) side of the mode, distant $1\cdot219$ to the left of the centre of gravity, the number of observations contained between two points on the right or upper branch, at distances x_1, x_2 respectively from the mode, is $\frac{1}{2}(\theta(\tau_2) - \theta(\tau_1))$; where θ is the integral of the error-function given in the books, viz.,

$$\frac{2}{\sqrt{\pi}} \int_0^\tau e^{-x^2} \, dx; \quad \tau_2 = \frac{x_2}{5\cdot692}, \tau_1 = \frac{x_1}{5\cdot692}.$$

The corresponding formula with the modulus $3\cdot532$ is to be used for the left branch.

The calculation is exhibited in Table III. The first column gives the distance of points at intervals of an inch on the abscissa from the mode as above determined. In the second column each

der deutschen Botanischen Gesellschaft, Band xii, 1894, pp. 197—207.   Cp.
Botanisches Centralblatt, Band lxvii, 1896, p. 347).   The idea of two probability
curves with different moduli, which is here carried out, is suggested by Dr. F.
Ludwig in the *Botanisches Centralblatt,* Band lxxiii, 1898, p. 348.
    [2] See Appendix, Note 12.
    [3] *Ante, Journal of the Royal Statistical Society,* 1898, and March, 1899.

distance is divided by the modulus proper to the branch of the curve to which that point belongs, viz., 5·692 for the upper branch (lower pressures), dealt with in Part I of the table, and 3·532 for the lower branch, dealt with in Part II. From the values of τ thus found, I obtain from Tables I and II appended to De Morgan's Calculus of Probabilities, the values of log $\int_0^\infty e^{-x^2} dx$: the logarithm of that proportion of $\sqrt{\pi} \times$ the total area contained by a probability-curve which lies beyond each assigned τ,—of that tail $\times \sqrt{\pi}$. *Twice* the figure for the proportion of the tail to the whole body of a probability-curve (of unit area) stands for the proportionate tail of a *half* probability-curve. Further, recollecting that the area of each of our half-curves is proportioned to its modulus, we have, in order to find the proportion of the sum total of observations beyond any point on the upper branch, to multiply the tail of the halved unit-probability-curve by

$$c_1 \div (c_1 + c_2) = \frac{5\cdot6926}{5\cdot6926 + 3\cdot532,}$$

and similarly to affect the proportions for the lower half. The proportions thus found are to be multiplied by 365 for the *number* of observations beyond each point. The logarithmic operations corresponding to these multiplications and divisions are indicated in the heading to Col. 4. It comes to the addition of 2·405111 to each entry in Col. 3 of Part I, and of 2·1752 to each entry of Col. 3 of Part II. The numbers beyond each point having been found (Col. 5), the numbers in each interval are given as differences in Col. 6; to be compared with the real observations in Col. 7; with results shown in Col. 8.

It only remains to show how the contents of the central compartment are calculated. The number *above* 301·5 proves by our calculation to be 207·23; and the number above the mode is the number in the upper branch, viz., $\dfrac{5\cdot6926}{5\cdot6926 + 3\cdot532} \times 365$, that is, 225·25. There ought to be thus between the mode and 299·5, 18·02; and it is similarly shown that there ought to be between the mode and 300·5, 139·76 − 114·79 = 24·97. Therefore the total contents of the compartment, 300·5 − 301·5, ought to be 24·97 + 18·02 = 43. It is 46·96; showing an error of 3·96.

TABLE III. PART I.—*Application of the Composite Probability-Curve to Barometric Heights below* 30·1006 *inches at Babbacombe.*

1 Distance from 301·006.	2 Col. 1 ÷ 5·6926.	3 $\mathrm{Log} \int_{\text{Col. 2}}^{\infty} e^{-x^2}\, dx.$	4 Col. 3 − log $\sqrt{\pi}$ + log 2 + log 365 + log 5·6926 − log (5·6926 + 3·532).	5 Log⁻¹ Col. 4.	6 Differences of Col. 5.	7 Observations.	8 Errors.	Height in Tenths of an Inch.
0·506	0·08888	$\overline{1}$·911340	2·316451	207·230				300·5
					45·530	45·92	0·41	
1·506	0·26450	$\overline{1}$·803607	2·208718	161·700				299·5
					41·430	41·27	0·14	
2·506	0·44020	$\overline{1}$·675053	2·080164	120·272				298·5
					31·780	36·12	4·34	
3·506	0·61588	$\overline{1}$·541893	1·946904	88·492				297·5
					28·906	26·85	2·06	
4·506	0·79155	$\overline{1}$·370038	1·775149	59·586				296·5
					19·526	18·62	0·91	
5·506	0·96720	$\overline{1}$·197605	1·602716	40·060				295·5
					15·781	15·15	0·63	
6·506	1·14290	$\overline{2}$·980129	1·385230	24·279				294·5
					9·839	9·31	0·53	
7·506	1·31850	$\overline{2}$·754475	1·159586	14·440				293·5
					6·217	6·04	0·18	
8·506	1·49420	$\overline{2}$·499270	0·904380	8·023				292·5
					3·604	2·81	0·79	
9·506	1·66989	$\overline{2}$·240250	0·645369	4·419				291·5
					2·284	1·88	0·40	
10·506	1·84555	$\overline{3}$·924320	0·329430	2·135				290·5
					1·166	0·69	0·48	
11·506	2·02120	$\overline{3}$·581371	$\overline{1}$·986480	0·969				289·5
					0·515	0·46	0·06	
12·506	2·19690	$\overline{3}$·252400	$\overline{1}$·657510	0·454				288·5
					0·271	0·38	0·11	
13·506	2·37250	$\overline{4}$·857941	$\overline{1}$·263050	0·185				287·5
					0·106	0·42	0·31	
14·506	2·54820	$\overline{4}$·482820	$\overline{2}$·887390	0·077				286·5
					0·030	0·19	0·16	
15·506	2·72390	$\overline{4}$·193640	$\overline{2}$·598750	0·037				
							11·51	

TABLE III *Contd.* PART II.—*Babbacombe Barometric Heights (above* 30·1006 *inches).*

1 Distance from 301·006.	2 Col. 1 ÷ 3·532.	3 $\mathrm{Log} \int_{\mathrm{Col.1}}^{\infty} e^{-x^2}\,dx.$	4 Col. 3 − log $\sqrt{\pi}$ + log 365 + log 2 + log 3·532 − log (3·532 + 5·6226).	5 Log⁻¹ Col.4.	6 Differences of Col. 5.	7 Observations.	8 Errors.	Heights in Tenths of Inches.
0·494	0·13980	$\bar{1}$·88463	2·05989	114·786				
					41·099	38·88	2·22	301·5
1·494	0·42298	$\bar{1}$·69213	1·86739	73·687				
					30·788	30·19	0·60	302·5
2·494	0·70610	$\bar{1}$·45717	1·63244	42·899				
					20·370	18·23	2·14	303·5
3·494	0·98920	$\bar{1}$·77490	1·35275	22·529				
					12·843	13·65	0·80	304·5
4·494	1·27230	$\bar{2}$·81091	0·98617	9·686				
					5·845	7·31	1·46	305·5
5·494	1·55550	$\bar{2}$·40913	0·58439	3·841				
					2·513	3·12	0·61	306·5
6·494	1·83860	$\bar{3}$·94786	0·12312	1·328				
					0·965	0·38	0·58	307·5
7·494	2·12170	$\bar{3}$·38498	$\bar{1}$·56024	0·363				
					0·269	0·31	0·04	308·5
8·494	2·40480	$\bar{4}$·79625	$\bar{2}$·97151	0·094				
					0·073	0·08	0·01	309·5
9·494	2·68799	$\bar{4}$·14514	$\bar{2}$·32040	0·021				
							8·46	310·5

The account of error now stands thus (see table).

Part I	11·51
,, II	8·46
Central compartment	3·96
Total	23·93

$$23 \cdot 93 \div 365 = 0 \cdot 655.$$

The resulting error is not much greater than that which we incurred in the case of the method of translation.[4] Thus the method of composition is not so inferior to the method of translation in accuracy, as it is in respect of *à priori* authority. If we consider the remaining criteria of excellence—it will be remembered that *five* were enumerated[5]—it will be found, I think, that neither method is, like Gompertz' law, specially adapted to some particular practical purpose. In simplicity of conception the method of composition seems to have the advantage. It has also the advantage in facility of work. This advantage appears not only in the calculation from *moments*, but also in a calculation from *percentiles*, which seems to be possible for this method, as well as the method of translation.

[4] *Ante, Journal of the Royal Statistical Society,* 1898, p. 681.
[5] *Ante,* 1898, p. 672.

The *mode* being as it were the key of this method—as the median was of the method of translation[6]—the question occurs: Can we dispense with the trouble of computing the moments by ascertaining the mode directly from observation? The determination of the mode from the observations, without assuming the form of the curve, is no doubt a delicate business. I have, however, employed with advantage a known rule for determining the position of a maximum by *interpolation*.[7] The rule will be sufficiently understood from its application to the example before us.

There are given the number of observations (per 365) *at* each tenth of an inch: *e.g.*, 46·96 observations at 301 tenths, or, what comes to the same, between 301·5 and 300·5 tenths; 45·92 observations between 300·5 and 299·5 tenths, and so on. The *whereabouts* in that neighbourhood of the mode being ascertained by inspection, take consecutively four of the points on the abscissa between each consecutive two of which the number of observations are given, *e.g.*, the points 301·5, 300·5, 299·5, 298·5 (tenths); selecting the points so that the mode should be likely to fall between the *second* and *third* of the four points.

Let the number of observations reckoned from one extremity of the curve, *e.g.*, the *lower* extremity (corresponding to the *highest* pressure[8]), up to the first point, viz., 301·5, be a, up to the second point, 300·5, be b, and so on, as given in the accompanying statement; the numerical value of a in the case before us proving to be 112·15, that of b 159·11, and so on.

Tenths of Inches.	No of Observations.	No of Sums of Observations.	
301·5 (a)	38·88	112·15 (a)	u_a
	46·96		
300·5 (b)	45·92	159·11 (b)	u_b
299·5 (c)		205·03 (c)	u_c
	41·27		
298·5 (d)		246·30 (d)	u_d

Then, if x is the distance measured in a positive direction (that is, towards the lower pressure) from 301·5, we have $0 =$

$$1 \times \frac{6x - 2(a + c + d)}{(b - a)(b - c)(b - d)} + 2 \times \frac{6x - 2(a + b + d)}{(c - a)(c - b)(c - d)} + 3 \times \frac{6x - 2(a + b + c)}{(d - a)(d - b)(d - c)},$$

a simple equation for x, from which I find, on substituting the values for a, b, &c., given in the annexed statement, and working out the arithmetic, $x = 0·494$, which *subtracted* from 301·5, gives 301·006 (tenths of an inch) for the position of the mode; a result almost identical with that determined by the method of moments, since the centre of gravity is at 299·787, and this *added to* 1·219 (the value found for x' by the use of moments) = 301·006.

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[6] *Ante*, pp. 677 and 678. See Appendix, Note 13.

[7] Not taking for granted the equation of the curve (cp. *ante*, 1898, p. 697, Note 7, par. 1).

[8] *Ante*, 1898, p. 679.

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The mode having been determined, the moduli may be readily found by the method of percentiles. Thus, if q_1 is the distance from the mode of the point which just divides the number of observations above the mode into two halves, then $q_1 = 0\cdot4769 \times c_1$; or, without resorting to interpolation to discover the quartile, we may as before[9] use one of the given percentiles with the aid of the usual tables. For example, in the upper limb of the curve there are given between $300\cdot5$ and $298\cdot5$ $41\cdot92 + 41\cdot27$, that is $83\cdot19$ observations, and we may assume that there are $23\cdot76$ observations between the mode, if at $301\cdot006$, and the point $300\cdot5$, since there are given $46\cdot96$ observations between $301\cdot5$ and $300\cdot5$. There are then between the centre of the upper probability-curve and the point $298\cdot5$, $83\cdot19 + 23\cdot76$, that is, $106\cdot95$ observations. Also the total number of observations above the mode is $229\cdot87$ ($206\cdot11^{\cdot}$ counted from the upper extremity—the lower pressure—up to the point $300\cdot5$, $+ 23\cdot76$ assumed to lie between $300\cdot5$ and the mode). Thus between the centre of the probability-curve (the point $301\cdot006$) and the point $298\cdot5$, the proportion of the observations is $106\cdot95 \div 229\cdot87 = 0\cdot4653$. From the tables we find that $0\cdot4653$ of the area corresponds to $0\cdot439$ of the modulus. Therefore $0\cdot439$ × modulus is to be equated to the distance between $301\cdot006$ and $298\cdot5$, *i.e.*, $2\cdot506$. Whence the modulus $= 0\cdot57$, nearly the same as the value found before, namely, $0\cdot569$.

The modulus for the lower limb may be deduced from the proposition that the moduli are respectively proportional to the number of observations on each side of the mode. Or two (or more[10]) independent determinations by way of percentiles may be combined.

This is, I think, one of the easiest methods yet proposed for representing with tolerable accuracy an unsymmetric group. In order to reduce the equation for the mode to the form $Ax - B = 0$, where A and B are numerical coefficients, there are required only a few additions, and some logarithmic operations, which involve finding the logarithms corresponding to *nine* numbers and finding the numbers corresponding to six logarithms.

Thus the method of translation does not in all respects compare to advantage with the method of composition. It may be remarked that a comparison is almost always possible, since the range of cases to which the method of composition is confined almost coincides with the limit which has been found for the method of translation. That method, it will be remembered, begins to be inapplicable when the asymmetry of the given group is such that

$$\mu_3 > \frac{\sqrt{8}}{3}\, \mu_2^{\frac{3}{2}}. \qquad {}^{11}$$

The limit at which the method of composition becomes impossible is $\mu_3 = \mu_2^{\frac{3}{2}}$. [12]

The comparison of the method of composition with the method of separation described in our second part presents similar points.

[9] *Ante*, 1898, p. 683.
[11] *Ante*, 1898, p. 697.
[10] Ibid., p. 684.
[12] See Appendix, Note 14.

In respect of accuracy, indeed, I cannot make the comparison so complete as the former one, not having worked out all the figures according to method of separation. I should be quite prepared to find that the latter had some advantage in accuracy, since it has *five* constants at its disposal, namely, the position of the centre of gravity, the two central distances, and the two moduli; while the method of composition involves only *three* constants, corresponding to the position of the mode and the two moduli. But this advantage on the part of the method of separation is purchased dearly by the great labour of determining the five constants.

It appears that the method of separation, considered as a general method of representing ordinary curves of frequency in the absence of special data, is confined to a certain range of asymmetry as well as the method of composition. For if it is assumed, as agreeable to ordinary experience, that the required curve has only one maximum, on either side of which the curve descends continually, then it may be shown that this condition is not compatible with any considerable degree of asymmetry as measured by the difference—or the ratio—between the two limbs of the total curve which extend on either side of the mode up to some extreme limits, say the points outside which only a five-hundredth or only a thousandth of the given observations may occur. It is evident by inspection, as one may say, that the disparity between these limbs cannot be very great consistently with the uniformity of the total curve by hypothesis separable into two probability-curves. Analysis shows that the limits are even narrower than might be expected.[13]

I have dwelt the longer on the case of the composite probability-curve, as it is calculated by its novelty and extreme character to fix attention on the essential attribute of the class now under consideration, namely, deficiency of *à priori* justification. I go on to consider some better known species of the class which possess the attribute in a less marked degree.

APPENDIX.

(Continued from p. 140.)

NOTE 12 (referring to p. 374).

On the Construction of the Composite Probability-Curve.

The equations to the half probability-curve which are to be tacked together at the mode, are respectively—

$$y_1 = \frac{\alpha}{\sqrt{\pi} c_1} \; e^{-\frac{x^2}{c_1^2}}; \;\; y_2 = \frac{\beta}{\sqrt{\pi} c_2} \; e^{-\frac{x^2}{c_2^2}};$$

where $\alpha + \beta = 1$ and c_1, c_2 are the respective moduli, the mode

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[13] See Appendix, Note 15.

being taken as the origin. The condition that the curves should have a common greatest ordinate, gives $\alpha : \beta :: c_1 : c_2$. Whence—

$$y_1 = \frac{c_1}{\sqrt{\pi}\,(c_1 + c_2)}\, e^{-\frac{x_2}{c_1{}^2}}\,;\ \ y_2 = \frac{c_2}{\sqrt{\pi}\,(c_1 + c_2)}\, e^{-\frac{x^2}{c_2{}^2}}.$$

Put x' as the distance of the centre of gravity from the mode. Then, if the centre of gravity and the second and third moments of the observations about the centre of gravity are given, we may determine x', c_1, and c_2 as follows :—

Taking first moments about the origin, we have (c_1 being the modulus for the curve on the *right*, the positive side of the origin)—

$$(1.)\quad x' = \frac{1}{\sqrt{\pi}}\frac{c_1{}^2 - c_2{}^2}{c_1 + c_2} = \frac{c_1 - c_2}{\sqrt{\pi}}.$$

Taking second and third moments, we obtain—

$$(2.)\quad x'^2 + \mu_2 = \frac{1}{2}\frac{c_1{}^3 + c_2{}^3}{c_1 + c_2}.$$

$$(3.)\quad x'^3 + 3\mu_2 x' + \mu_3 = \frac{1}{\sqrt{\pi}}\frac{c_1{}^4 - c_2{}^4}{c_1 + c_2}.$$

These equations may be simplified by putting $c = c_1 + c_2$, $c' = c_1 - c_2$. Then—

$$(1.)\quad c' = \sqrt{\pi}\,x'.$$

$$(2.)\quad x'^3 + \mu_2 = \frac{1}{2}(\tfrac{1}{4}c^2 + \tfrac{3}{4}c'^2) = \tfrac{1}{8}c^2 + \tfrac{3}{8}\pi x'^2$$
$$c^2 = 8\mu_2 - x'^2(3\pi - 8).$$

$$(3.)\quad x'^3 + 3\mu_2 x' + \mu_3 = \frac{1}{2\sqrt{\pi}}(c^2 + c'^2)c'.$$

Substituting the values in terms of x' which have been obtained for c and c', we have finally $x'^3(\pi - 3) - \mu_2 x' + \mu_3 = 0$; a cubic equation, from which a suitable value of x' is to be found and substituted in the expression for c and c'. It must be such as to make c^2 positive.

NOTE 13 (referring to p. 378).

On the Use of Percentiles in the Method of Composition.

Assuming, as before (*Journal of the Royal Statistical Society*, 1898, p. 698), u_x to be the number of observations reckoned from one extremity up to the point x (which is measured from any fixed origin); if u_a, u_b, u_c, u_d be four such sums in the neighbourhood of the mode; then, x being measured from a,

$$u_x = 0\frac{(x - b)\,(x - c)\,(x - d)}{(a - b)\,(a - c)\,(a - d)}u_a + 1\frac{(x - a)\,(x - c)\,(x - d)}{(b - a)\,(b - c)\,(b - d)} + \&c.,$$

according to Lagrange's formula. Accordingly $\dfrac{du_x}{dx}$ gives the ordinate at any point x; and therefore $\dfrac{d_2 u}{dx^2} = 0$, the condition that the ordinate should be a maximum (*cf.* Boole, *Finite Differences*, p. 42,

3rd edition); the position of the *mode*. There results a simple equation given in the text. In the example there given, x falls between a and b; it would have been better to have taken a, b, &c., so that the mode should fall between b and c, for reasons given by Demorgan in the chapter on *Interpolation* in his *Differential Calculus* (p. 545).

<div align="center">NOTE 14 (referring to p. 379).</div>

<div align="center">*On the Limits to the Method of Composition.*</div>

Since each of the moduli must be positive, the smaller one, viz.

$$\tfrac{1}{2}(\sqrt{8\mu_2 - x'^2}\,(3\pi - 8) - \sqrt{\pi}x') > 0.$$

<div align="center">Whence $8\mu_2 - x'^2\,(4\pi - 8) > 0.$ $x'^2 < \dfrac{2\mu_2}{\pi - 2}.$</div>

Employing this condition as to x'^2 in the bracketed portion of the equation, $x'\,(x'^2\,(\pi - 3) - \mu_2) + \mu_3 = 0$, we see that the expression in brackets must be negative. Whence x' must be of the same sign as μ_3; we may say positive without loss of generality. Now when μ_3 is positive, if the cubic equation has two impossible roots, x' cannot be positive; the only possible root is negative. Therefore the equation must have all its roots possible. The condition that the equation should have all its roots possible—

$$\frac{1}{4}\frac{\mu_3^2}{(\pi - 3)^2} < \frac{1}{27}\frac{\mu_2^3}{(\pi - 3)^3};\ \ \mu_3^2 < \frac{4}{27\,(\pi - 3)}\ \mu_2^3 < 1.04\ldots\mu_2^3;$$
$$\mu_3 < 1.0\ldots\mu_2^{\frac{3}{2}}.$$

<div align="center">NOTE 15 (referring to p. 380).</div>

<div align="center">*On the Limits of the Method of Separation.*</div>

To consider the limits to the asymmetry of a curve separable into probability-curves, consistent with the supposition that the curve has only one maximum, on either side of which the ordinate decreases as the distance from the mode increases; we may, without loss of generality, suppose one component to have its centre constantly at the origin, and its area and modulus constant, say unity; while the other component has x' for the distance of its centre from the origin, c for its modulus, and a for its area; x' being positive, and a less than unity. A further restriction is imposed by the condition that a should not be very small, say not less than a hundredth or even a tenth. For otherwise the effect of the second component in disturbing the symmetry of the first would be insensible, especially when x' is not very great. Within these bounds we are free to vary the constants x', c, and a, so as to make the asymmetry as great as possible. We have then the condition that at the limit, when in the course of varying these coefficients we have reached a shape which is just ceasing to be single-headed, at the place where, if the variation is continued, a second maximum is just about to appear, there must be in general a point of inflexion at which the tangent to the curve is horizontal, as intended to be represented in the annexed diagram; where the dotted curve illustrates the transgression of the limiting condition.

A limiting case of this limitation is where Q is identical with P, the point of maximum height.

Let us begin with this particular and, as it will appear, particularly important case. Let Y be the ordinate of the curve PQ, formed by the superposing the ordinates of the two probability-curves

$$y_1 = \frac{1}{\sqrt{\pi}} e^{-x^2} ; \quad y_2 = a \frac{1}{\sqrt{\pi} c} e^{-\frac{(x - x')^2}{c^2}}$$

Then, if x is the abscissa of P (coincident with Q), we have the equations

$$(1)\ \frac{dY}{dx} = 0 ; \qquad (2)\ \frac{d_2 Y}{dx^2} = 0 ; \qquad (3)\ \frac{d_3 Y}{dx^3} = 0 ;$$

(with a further condition as to the fourth differential).

Whence, ξ being put for $\frac{x - x'}{c}$,

(1) $- 2xy_1 - 2\xi y_2 \div c = 0.$
(2) $(4x^2 - 2)y_1 + (4\xi^2 - 2)y_2 \div c^2 = 0.$
(3) $- (8x^3 - 12x)y_1 - (8\xi^3 - 12\xi)y_2 \div c^3 = 0.$

From (1) and (2) we have $x(2\xi^2 - 1) - \xi(2x^2 - 1) \times c = 0 ;$

$$(4)\ c = \frac{2\xi^2 - 1}{2x^2 - 1} \frac{x}{\xi}.$$

In this equation c is essentially positive. Also x is positive, since on the negative side of the origin O the ordinates of *both* the component curves diminish as one moves leftwards (x' as aforesaid being positive), and therefore there cannot occur a maximum of their sum. By parity x' must be on the right of x, since both ordinates diminish on the right of x' ; therefore $\xi = (x - x') \div c$, is negative. Whence it appears from (4) that when ξ^2 is greater than 0.5, x^2 must be less than 0.5, and *vice versa*.

Take in now equation (3) and, by eliminating both the ratio $y_1 : a y_2$ and c, find an equation between x and ξ. This equation is found to involve only even powers of those variables. Solving for x^2 in terms of ξ^2, we may write the equation in the form—

$$(5)\ - (x^2 - \xi^2) \left(x^2 - \frac{3 - 2\xi^2}{2 + 4\xi^2} \right) = 0.$$

The first solution, $x^2 = \xi^2$, corresponds to the case in which

$x = -\xi$, $c = 1$, $a = 1$; the case of perfect equality between the components and perfect symmetry in the compound, which is not what we require. It may be observed that in this case equation (3) is not independent of equations (1) and (2); the satisfaction of equation (2) must be secured by putting $x^2 (= \xi^2) = 0.5$.

Confining ourselves to the other solution, $x^2 = (3 - 2\xi^2) \div (2 + 4\xi^2)$, we have the symmetrical relation $2x^2 + 2\xi^2 + 4x^2\xi^2 = 3$. From this equation combined with (4) we can find the ξ and c corresponding to any x; x' is given by the equation $\xi = (x - x') \div c$; and α by substituting the values which have been found for the other variables in equation (1). Observing that $\left(\dfrac{d\alpha}{dx}\right)$ is continually positive, $\left(\dfrac{d\alpha}{d\xi}\right)$ continually negative, $\dfrac{d\xi}{dx}$ continually negative, we see that α continually increases (from zero) with the increase of x. At the limit $x^2 = \xi^2 = 0.5$, α becomes unity. The values of x^2 above that limit correspond to solutions in which the larger component curve is on the right. Viewed from below the plane of the paper, by interchanging x and ξ, and properly altering the unit of the abscissa, each solution of this type may be considered as belonging to the type with which we started: the centre of the component with smaller area being on the right, the positive, side of the larger component's centre.

Accordingly we may confine ourselves to the range of solutions between the limits $x = 0$ and $x = \sqrt{0.5}$. At the lower limit the subsidiary component vanishes; at the higher limit it becomes equal to the other component. The case of maximum asymmetry is to be found somewhere between these limits. I have constructed a simple table (not reproduced here) for the constants ξ, x', and a, corresponding to values of x at intervals of 0.1, viz., $x = 0.1$, $0.2 \ldots 0.7$. From an inspection of this table I surmise that no great degree of asymmetry is attainable consistently with the conditions expressed in our first three equations.

For instance, corresponding to $x = 0.5$, I find

$$x^2 = 0.25; \; \xi^2 = 0.83'; \; \xi = 0.9128\ldots;$$
$$c = 0.73029\ldots; \; x' = 1.16'; \; a = 0.52347\ldots$$

Here the asymmetry as tested by the distance of the extremities from the mode is not very great. Take a point distant 2 on the negative side from the origin as the effective extremity on that side; outside which there lies only 0.0015 of the total area. The corresponding point on the other side is approximately 2.517. The distances of these extremities from the mode $x = 0.5$ are respectively 2.5 to the left, 2.017 to the right; showing no great difference. The skewness may well be greater, as more accurately measured by the relation of the mean cube to the (sesquiplicate power of) the mean square of error about the centre of gravity.

I have not taken the trouble of ascertaining the position of the maximum more exactly; I surmise that it would not be possible to attain a much greater degree of inequality in the limbs consistently with our first three equations.

But in general only the first two of these equations hold, while for the third is to be substituted the condition that the expression on the left of (3), or its equivalent (5), which was equated to zero, should now be less than zero. This, to secure that the curve should trend *downwards* at the point of contact and inflexion, as shown in the diagram. From this condition it appears that to any value of ξ^2, which without loss of generality we may suppose above 0·5, there goes a value of x^2 below that value which if equation (3) held good would correspond to the value of ξ^2. For instance, if ξ^2, as in the last example, $= 0\cdot83'$, then x^2 must be less than 0·25. For it follows from equations (1) and (2), as shown above, that ξ^2 being greater than 0·5, x^2 must be less than 0·5. And x^2 cannot lie between 0·5 and 0·25, as the left hand member of (5) would then be *positive*. Say $x^2 = 0\cdot16$, $x = 0\cdot4$. Then for the assigned values of x and ξ I find $c = 0\cdot42969$ $x' = 0\cdot79215$ $a = 0\cdot15855$, a system which seems to allow even less play for the inequality of the limbs than the preceding one. However, the distance between the mode and centre of gravity is greater than in the former case; and the skewness measured by the relation of the second and third moments may well be considerable. We are entitled to conclude from the investigation that a given curve or histogram which, without break in the decline of the ordinate from its maximum, stretches to a much greater distance on one side of the mode than on the other—like the statistics of the duration of American marriages, which Professor Pearson gives in his second contribution to the Royal Society—is not a promising case for the application of the method of separation. We may surmise that great inequality in the length of the limbs being excluded, no extreme skewness, as measured by the moments, is likely to occur.

<div style="text-align:center">(To be continued.)</div>

II.—*The Census of* 1901.

A SPECIAL Committee has been appointed by the Council to make suggestions with regard to the approaching Census of 1901. In May, 1899, it submitted to the Council the following Preliminary Report :—

The Census (1901) Committee, having held two meetings, unanimously recommend to the Council that a letter should be, without delay, sent in to the President of the Local Government Board, and to the Secretary of State for Scotland, and the Chief Secretary for Ireland, covering a copy of the Report of the Society's Imperial Census Committee of 1891, and urging the importance of proceeding with the Census Acts for 1901 as speedily as possible, and the importance of an intermediate Census for 1906. The draft of such a letter, stating the views of the Committee, is submitted herewith for the consideration of the Council.

The Committee also recommend that copies of the letter should be communicated to the Press after it has been transmitted to the authorities to whom it is addressed.

R. GIFFEN,
Chairman.

In accordance with the recommendations therein contained, the following letter was addressed to the President of the Local Government Board, the Secretary for Scotland, and the Chief Secretary to the Lord Lieutenant of Ireland:—

ROYAL STATISTICAL SOCIETY.

SIR,—In view of the near approach of the date for the Census of the United Kingdom in 1901, the Council of the Royal Statistical Society desire to direct your attention to the accompanying copy of the report of a Committee appointed to consider the subject of an Imperial Census in 1891, which was brought under the notice of the Government in 1889.

The experience of another ten years has further impressed the Royal Statistical Society with the increasing importance, value, and even necessity of trustworthy population statistics for a variety of political, social, and commercial purposes.

It is universally admitted that a decennial Census no longer furnishes an adequate basis for the necessary estimates of population in intercensal years. The intermediate London Census in 1896, enacted by the London (Equalisation of Rates) Act, 1894, has demonstrated the advantages that would result from an intermediate Census for the whole country.

The very numerous changes of local areas consequent upon the administration of the Local Government Act, 1894, Local Government (Scotland) Act, 1894, and Local Government (Ireland) Act, 1898, render it more than ever desirable that the Statutes authorising the Census in 1901 should be passed at an earlier date than has been the case on the occasion of recent Censuses.

The Royal Statistical Society therefore request that you will support and bring to the notice of the Government their renewed and urgent appeal—

(1) That the next Census Acts may be passed, if not this Session, at any rate in the early days of next Session, in order that sufficient time may be allowed for fully considered and thoroughly efficient preparatory arrangements.

(2) That the Acts may make provision, not only for the decennial Census in 1901, but also for an enumeration of the population, at least by sex and age, in 1906.

(Signed)   LEONARD COURTNEY,
President of the Royal Statistical Society.

R. GIFFEN,
Chairman of the Census (1901) *Committee.*

24th May, 1899.

The enclosure in the above letter is as follows:—

ROYAL STATISTICAL SOCIETY.

_____

IMPERIAL CENSUS *of* 1891, COMMITTEE.

THE Committee appointed by the Council of the Royal Statistical Society with reference to the Census of 1891, submit the following report:—

1. The Committee desire to repeat, but with increased urgency, the recommendation made by former committees, that a census of the United Kingdom should be taken more frequently—once in every five years, instead of at intervals of ten years.

2. The information to be thus acquired with regard to the growth, movement, and condition of the population, becomes every year more needful for manifold practical purposes connected with the general and local government of the country. It is not less required as a basis for those inquiries into the physical, sanitary, and social condition of the people, which at the present time are generally recognised to be essential to their well-being.

3. This information is not supplied by the annual estimates calculated by the Registrar-General from the records of births and deaths, &c.; because, although for the last three censuses the difference between the calculated and the enumerated aggregates of the population of England and Wales amounted to less than 1 per cent., those estimates furnish no guide to the changes in different parts of the country, and especially to the changes, in opposite directions, among the dwellers in town and country, all of which it is important to ascertain and bring to notice at short intervals.

4. It is a fact that while the calculated estimates of the population of certain towns between 1871 and 1881 were so accurate as to come within 1 per cent. of the truth, in others the estimates exceeded the truth by as much as 11 per cent., while in one they fell short of it by as much as 18 per cent. In some the conditions were so changed as to render any comparison impracticable. The error in all London was 3 per cent., but in the sanitary districts of Kensington and Battersea it was 26 and 39 per cent. respectively. Indeed, so strongly has the Registrar-General become convinced of this fact, as the distance from the last census increases, that he has ceased to publish estimates of the population in the case of all the " smaller towns," fifty in number, and calls attention to the untrustworthy character of the estimates relating to several of the twenty-eight principal towns.

5. The Committee would observe that the United Kingdom is in this respect behind many countries of Europe and America, and even some of its own colonies. Since 1866 a census of the whole German Empire has been taken quinquennially. In Sweden

a quinquennial census has been taken since 1805; in France since 1835; and in Finland since 1875. In the United States the Federal Government has only taken a decennial census, but fifteen of the States and Territories took an intermediate census in 1885. Among our own colonies a quinquennial census is taken in New Zealand, Queensland, Manitoba, and in portions of the North-West Territory of Canada.

6. Although there may have been special reasons in some of those countries for numbering the population every five years, they are not more important than those which have created such a general agreement and increasing demand for a similar measure in this country; while the actual expenditure in partial inquiries by central and local authorities, and the manifold inconveniences and probable losses incurred through the want of accurate and recent information, outweigh by far the increase of expenditure which an intermediate census would entail.

7. This expenditure, it must be observed, would not necessarily be double that of a decennial census, because some economy might be effected in the preparations and arrangements for taking and publishing the results, if the census were made at shorter intervals than ten years. Under the present system the acquired skill and experience of the officers employed—both local and central—are in a great measure faded and lost. A fresh organisation has to be created on each occasion, and the employment of unskilled and untrained hands is productive of great waste and loss of time and money.

8. There are two measures which might facilitate and improve the taking of the census at any interval.

The first is the passing of the Census Act at an earlier date than hitherto. It is considered that two years, instead of one, or less than one, as on the last occasion, should be secured for making the necessary preparations. The Committee therefore recommend that the Act for the Census of 1891 should be passed as early as may be practicable in the Session of 1889.

In connection with this point, it is further recommended that a permanent Act should be passed for a quinquennial census, to be taken in such manner and with such particulars as may be decided by Parliament, leaving the precise day on each occasion to be fixed by an Order of Her Majesty in Council.

9. The second measure is the appointment of a separate Census Branch in the General Registry Office for England and Wales, whose whole attention may be given to the business of the census of that part of the United Kingdom, without the periodical interruption and dislocation of the business of registration which has hitherto been productive of much inconvenience.

The officers of such a branch would find full employment in making and accelerating the preparations for each quinquennial census of England and Wales, in organising the machinery for taking it, in training and superintending the persons (generally unskilled and often ill-qualified) who are employed in abstracting and tabulating the returns, and in expediting the printing and publishing of the results.

From an office so constituted, having in charge the records of each census, and the key to their contents, the Legislature and the Executive Government would be able from time to time to procure information regarding the population, which has hitherto been inaccessible.

Such an office might also undertake a work which is much required, viz., that of making available to the public, in a convenient shape, and with as much uniformity as may be practicable, the principal results of the several censuses of the United Kingdom, India, and the Colonies.

A further duty of such an office would be to study the means of promoting uniformity in the census of the different parts of the Empire, and, among other things, of revising the description and classification of occupations furnished by the census, with the view of meeting the requirements and facilitating the inquiries of the industrial departments of the Board of Trade and Home Office, of the great trade organisations, and of private individuals engaged in the investigation of industrial and social problems.

10. The Committee do not deem it expedient, in this their first report, to enter upon questions of detail with regard to the schedule of particulars to be inserted in the Act, or to the extent or shape of the information to be tabulated and published with the reports on the census, which require careful consideration, and about which there may be some difference of opinion. No such difference exists with regard to the several measures recommended in this report, and the Committee earnestly recommend their adoption.

<div align="right">Rawson W. Rawson,</div>

9th November, 1888.   *Chairman.*

*** The above was printed in the *Journal of the Royal Statistical Society*, in December, 1888 (see vol. lxi, p. 816).

III.—*The Agricultural Returns for* 1898.

THE agricultural statistics collected annually in Great Britain are now made public by the Board of Agriculture in several separate instalments, the earliest publication of the total areas of the principal crops and the number of live stock returned by the occupiers of land in the month of June, appearing before the end of August, and this being supplemented by successive issues furnishing complete details. These separate statements, together

with a variety of incidental matter respecting crop areas, production, and live stock, abroad as well as at home, and accompanied by comparative records of the imports, exports, and prices of agricultural produce, are eventually combined for permanent record in a final volume, and laid before Parliament in the return (C–9304) lately issued, containing one hundred and twenty separate tables on the subjects above indicated.

In an introductory report on the information supplied in these tables, Major Craigie indicates that the data obtained for Great Britain were in 1898 collected from 519,762 separate schedules, returned by persons occupying more than an acre of land, with supplementary returns for 13,077 owners of live stock who either occupied no land or whose holdings did not exceed an acre. Resort to estimate, in the absence of voluntarily rendered returns, was required in only 3 per cent. of the whole number.

From the report it appears that while the total area of land and water in Great Britain is given as 56,772,000 acres, of this surface 2,726,000 acres were estimated to have been covered by woods and plantations, and 12,857,000 acres by rough mountain or heath grazings carrying sheep or other stock. Apart from these totals, the technically cultivated area of permanent grass and arable land in 1898 covered 32,477,000 acres, rather less than 14 per cent. of this surface being in the occupation of its owners, and the remainder farmed by tenants.

It is pointed out that the " cultivated area," as defined for the purposes of these returns, continues to contract, the cumulative reduction amounting to 200,000 acres during the past seven years. But it is to be borne in mind that this is partly accounted for by greater strictness in the classification of permanent pasture as distinguished from rough grazings ; while another factor not to be overlooked lies in the ceaseless encroachments of the towns, and the growing demands of the urban populations, not only for building land, but for public parks, athletic grounds, waterworks, brickyards, &c.

The movement towards a decrease in the area of land under the plough, which showed a slight check in the returns of 1897, was again resumed, the reduction of the arable land in Great Britain in 1898 amounting to 90,000 acres.

In connection with crop areas, the most marked feature of last year was the further large increase—amounting to 11·3 per cent. over 1897, and 24·1 per cent. over 1896—in the wheat acreage. For the first time since 1892 the returns for Great Britain showed more than 2,000,000 acres under wheat, the total now being 2,102,000. The additional acreage of wheat was entirely gained at the expense of barley and oats, which covered a smaller surface. The report notices that while the current price of wheat during seed time went far to account for this transfer, the favourable weather at seed time had considerable influence.

By bringing the statistics supplied from Ireland and the Channel Islands into line with those for Great Britain, a summary for the whole of the United Kingdom is given in the report, as follows, for the past three years :—

United Kingdom.	1896.	1897.	1898.
AREAS.	Acres.	Acres.	Acres.
Under all crops and grass ...	47,882,099	47,868,553	47,792,474
Permanent pasture	27,973,688	27,924,710	27,978,699
Arable land	19,908,411	19,943,843	19,813,775
Corn crops	8,862,608	8,890,092	8,816,756
Green crops	4,429,264	4,327,568	4,261,441
Clover, &c., under rotation	5,960,449	6,152,798	6,211,012
Flax....................................	74,098	46,995	35,391
Hops	54,249	50,863	49,735
Small fruit	76,797	70,245	70,238
Bare fallow	450,946	405,282	369,202

The estimated total produce of the principal crops enumerated in Great Britain and in Ireland for the same period was as under :—

Crops.	1896.	1897.	1898.
	Qrs.	Qrs.	Qrs.
Oats................................	20,357,000	20,445,000	21,572,000
Barley.............................	9,728,000	9,077,000	9,341,000
Wheat.............................	7,281,000	7,037,000	9,361,000
	Tons.	Tons.	Tons.
Potatoes	6,263,000	4,107,000	6,225,000
Turnips	28,037,000	29,785,000	26,499,000
Mangold	5,875,000	7,379,000	7,228,000
Hay (all sorts)	11,416,000	14,043,000	15,916,000

Thus it appears the year 1898, the meteorological characteristics of which are noted in the report, was distinguished for high comparative yields. For the principal crops in Great Britain itself the relative position of the year is concisely shown by Major Craigie in the following table, in which the average of the estimated yields of wheat, barley, oats, potatoes, turnips, and hay, for the ten years 1888-97 inclusive is represented by 100 in each case, and the result of each harvest during that period, with the addition of that for 1898, is shown in relation to that standard :—

Year.	Wheat. Average 1888-97, 29·19 Bushels per Acre = 100.	Barley. Average 1888-97, 32·97 Bushels per Acre = 100.	Oats. Average 1888-97, 38·51 Bushels per Acre = 100.	Potatoes. Average 1888-97, 5·85 Tons per Acre = 100.	Turnips and Swedes. Average 1888-97, 13·50 Tons per Acre = 100.	Hay (Clover). Average 1888-97, 27·76 Cwts. per Acre = 100.	Hay (Permanent Grass). Average 1888-97, 22·95 Cwts. per Acre = 100.
1888	96	100	97	89	94	101	123
'89	102	96	102	106	108	121	127
'90	105	106	108	91	106	110	116
'91	107	104	101	98	98	103	102
'92	90	105	101	99	105	92	83
'93	89	87	92	113	99	68	55
'94	105	105	108	95	100	117	125
'95	90	96	96	114	96	97	83
'96	115	102	96	108	91	87	76
'97	100	100	100	88	104	105	109
'98	119	108	106	107	89	121	127

Except in the case of roots, it will be seen that the year's yield of all these crops exceeded the average to an extent varying from 6 per cent. in the case of oats to 27 per cent. in the case of meadow hay. The wheat crop was 19 per cent. over average, and it may be noted, in conjunction with the extended acreage, furnished nearly double the produce returned in 1895, when a bad season, coinciding with an exceptionally reduced area, resulted in a British wheat crop much smaller than in any preceding or succeeding year on record.

The returns of the number of live stock in Great Britain in 1898 present no abnormal features. The totals for the last three years may be given as follows :—

	1896. No.	1897. No.	1898. No.
Horses*	1,552,507	1,526,424	1,517,160
Cattle	6,493,582	6,500,497	6,622,364
Sheep	26,705,329	26,340,440	26,743,194
Pigs	2,878,801	2,342,302	2,451,595

* Only horses employed in agriculture, mares kept for breeding, and unbroken horses are returned.

An interesting table, especially in view of recent controversies on the subject of milk production, is given, showing that the proportion, not only of cattle, but of milch cows to population has decreased in Great Britain, the cows dropping from 82 per 1,000 persons, at which they stood in the average of the five years in 1871-75, to 73 per 1,000 in 1898.

The remarkable rise which took place in the value of wheat during part of 1898, has naturally led Major Craigie to devote special attention in his report to an examination of the fluctua-

tions in the price of corn during recent years, and more especially in the different sections of each year, and to illustrate the latter movements a diagram is given showing the price-curve, quarter by quarter, for the years 1893-98, in relation to the imports of wheat and flour arriving in the three-monthly periods referred to. The average price of wheat in 1898, 34s. per quarter, has only twice been exceeded in the last fifteen years. The maximum weekly average recorded in England and Wales during May, 1898, was 48s. 1d., but the price had again fallen to below 27s. per quarter at the end of December.

The following table gives a comparison of prices during each of the past three years, with those prevailing during the twenty years immediately preceding :—

Quinquennial Period.	Wheat.		Barley.		Oats.	
	s.	d.	s.	d.	s.	d.
Annual average, 1876-80	47	6	36	5	24	3
,, '81-85	40	1	31	2	21	2
,, '86-90	31	5	26	10	17	8
,, '91-95	27	11	25	3	18	–
Single year, 1896	26	2	22	11	14	9
,, '97	30	2	23	6	16	11
,, '98	34	–	27	2	18	5

It is again remarked in this as in previous reports that there are no prices of meat available which can be considered as of anything like equal comparative value to those collected for grain under the Corn Returns Act. Quotations from non-official sources for both beef and mutton from two London and two provincial markets are however noticed, and these, with a comparative note of the import values of meat furnished by the Customs, may be grouped for the periods above given. For beef per cwt. the figures stand as follows :—

Period.	Metropolitan Cattle Market.				London Central (Dead Meat) Market.				Liverpool Market.				Glasgow Market.				Average Values of Fresh Beef Imported.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
1876–80	59	6	to 81	8	40	10	to 73	6	49	–	to 67	8	57	2	to 68	10	53	4
'81–85	56	–	,, 80	6	42	–	,, 70	–	42	–	,, 64	2	57	2	,, 68	10	54	2
'86–90	36	2	,, 66	6	29	2	,, 57	2	32	8	,, 54	10	44	4	,, 54	10	44	7
'91–95	38	6	,, 65	4	28	–	,, 58	4	29	2	,, 50	2	35	–	,, 53	8	41	2
1896........	32	8	,, 61	10	22	2	,, 54	10	30	4	,, 46	8	32	8	,, 50	2	37	10
1897........	33	10	,, 63	–	30	4	,, 57	2	35	–	,, 49	–	35	–	,, 53	8	38	5
1898........	32	8	,, 59	6	29	2	,, 54	10	31	6	,, 47	10	35	–	,, 50	2	38	2

The prices given for the Metropolitan Cattle Market are based upon the dealings in live animals, while those at the Central Market refer, as indicated, to dead meat only. There is also the further difference that, while the animals sold at the Metropolitan Cattle Market are now all home bred, the meat at the Central Market comprises carcases both of home, foreign, and colonial origin.

A corresponding table for mutton, reproduced below, is subject to the same observations :—

Period.	Metropolitan Cattle Market.				London Central (Dead Meat) Market.				Liverpool Market.				Glasgow Market.				Average Values of Fresh Mutton Imported.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
1876–80	65	4 to 95		8	45	6 to 84		–	65	4 to 84		–	56	– to 67		8	—	
'81–85	68	10 ,, 93		4	46	8 ,, 82		10	60	8 ,, 80		6	58	4 ,, 68		10	58	5
'86–90	51	4 ,, 82		10	35	– ,, 71		2	51	4 ,, 72		4	58	4 ,, 70		–	41	2
'91–95	51	4 ,, 80		6	28	– ,, 67		8	44	4 ,, 66		6	49	– ,, 68		10	38	5
1896........	45	6 ,, 75		10	22	2 ,, 65		4	42	– ,, 66		6	45	6 ,, 63		–	32	7
1897........	51	4 ,, 79		4	23	4 ,, 67		8	42	– ,, 70		–	47	10 ,, 65		4	30	3
1898........	44	4 ,, 77		–	25	8 ,, 66		6	46	8 ,, 65		4	44	4 ,, 64		2	29	7

It will be seen that, speaking broadly, the prices of beef and mutton in the wholesale markets ranged lower in 1898 than in 1897, while, in comparison with the earlier periods given in the tables, the decrease is very marked.

The prices collected by the Board of Agriculture under the Markets and Fairs (Weighing of Cattle) Act of 1891 are summarized, and corroborate, in the markets to which they apply, the decrease of values above noted. Major Craigie observes that, so far as they go, these comparatively new statistics at least represent specific transactions on which averages could be based, and not merely, as in the quotations above given, more or less loosely formed estimates of the general range of values. Although the practice of weighing cattle at market makes but slow progress, it appears to extend slightly from year to year, and these returns are now become gradually more valuable. Possessing as they do the important merit of definiteness, a sufficient extension of their scope would furnish data of much statistical value.

Comparative tables of the quantities and values of the imports of agricultural products are as usual given in the annual returns, and the prefatory report contains a convenient summary, showing in millions of cwts. the quantities of wheat and flour imported from each of the chief sources of supply for fifteen years past. The table which is subjoined invites attention to the preponderance of the American supplies, the irregular extent of those from Russia,

Argentina, and India, and the recent development in the Canadian
total.

Sources of Imports of Wheat and Flour returned as Wheat.

Year.	United States.	Russia.	Argentina.	India.	Canada.	Other Countries.	Total.
	Mln. cwts.	Mln. cwts.	Mln. cwts.	Mln. cwts.	Mln. cwts.	Mln. cwts.	Mln. cwts.
1884........	36·1	5·5	0·2	8·0	2·7	14·4	66·9
'85........	39·7	12·1	0·3	12·2	2·1	15·9	82·3
'86........	39·9	3·7	0·3	11·0	4·1	8·0	67·0
'87........	50·6	5·6	1·0	8·5	5·3	9·2	80·2
'88........	31·8	21·8	1·7	8·2	2·2	14·7	80·4
'89........	31·0	21·6	—	9·2	2·8	14·3	78·9
1890........	33·9	19·7	2·8	9·1	2·4	14·5	82·4
'91........	43·2	14·6	2·5	13·0	4·6	11·6	89·5
'92........	60·9	4·4	3·5	12·5	5·8	8·5	95·6
'93........	57·2	10·1	7·9	6·2	4·7	7·7	93·8
'94........	46·8	16·8	13·3	5·4	4·5	9·9	96·7
'95........	45·3	23·1	11·4	8·8	5·1	13·6	107·3
'96	52·8	17·2	5·0	2·1	6·3	16·2	99·6
'97........	54·1	15·1	1·0	0·6	6·9	11·0	88·7
'98........	62·0	6·2	4·0	9·6	7·7	4·9	94·4

In several instances the statistics furnished as to colonial and
foreign agriculture are more complete than hitherto. This is
especially the case with regard to Australasia, where, thanks to
the co-operation lent to the Board by the Agents-General, many
of the tables have been extended, so as to afford information more
nearly in the detailed form adopted in the British returns, in
the Indian agricultural statistics, and in those of various foreign
countries. The completion of the long-delayed Belgian agricultural
census of 1895 has also rendered possible some extension and cor-
rection of the information previously available for Belgium.

In commenting on this section of the statistics, the report
notes that out of twenty-four countries shown in the comparative
tables of wheat production, official information as to area for as
late a date as 1897 is only available in twelve instances, although
in sixteen instances an estimate of total produce is supplied. The
comparative production of this crop in different countries, as well
as that of maize, barley, and oats, is commented on, and the latest
official records of the numbers of cattle and sheep afford occasion
for further international comparisons.

IV.—*The Statistics of Wages in the United Kingdom during the last
Hundred Years.* (Part III.) *Agricultural Wages*—Contd.
IRELAND. By A. L. BOWLEY, M.A.

THE estimation of agricultural wages in Ireland teems with
difficulties, and it does not seem possible to obtain more than an
approximate result. The authorities in this case are almost

exclusively reports of commissions, which contain discursive and
fragmentary statements made incidentally by witnesses and seldom
averaged or summarised. In chronological order :—Arthur Young
(*Tour in Ireland*, 1776-79) states daily wages in fifty villages
scattered throughout the country in 1776 (*circa*), and the rise
which had taken place in twenty years. Between 1801 and 1810
Statistical Accounts were drawn up, county by county, similar to,
but not so complete or scientific as, those for Scotland. The *Select
Committee on the State of the Poor in Ireland*, 1830, gives in a table
of " Grand Jury Presentments " daily wages in all counties. A
series of committees reported between 1833 and 1840; the gist
of the information thus given may be found in Inglis's *Journey
throughout Ireland*, 1834, and in Sir Henry Drummond's *Condition
of Agricultural Classes . . . . from Parliamentary Reports*, 1833-40.
The " Devon " *Commission on the Occupation of Land*, 1843-45,
afford copious evidence as to the condition of the labourers
immediately before the potato famine. "*Returns of Wages*, 1830-86,"
contains a table of daily wages in Ireland in 1862, on the same
plan as those of 1860 and 1870 for England and Wales. In 1870
the *Poor Law Inspectors* reported on wages in all districts and
estimated the change since 1850. The " Richmond " *Commission
on Agricultural Interests*, 1880-82, and the " Bessborough " *Com-
mission on Landlord and Tenant*, 1881, report many statements as
to wages, but in a very discursive manner. The " Cowper "
Commission on the Land Acts, 1886, contains, besides other data, a
report on daily wages by Dr. Grimshaw. The *Labour Commission*
devotes a volume to the subject, but wages are not summarised
as in the corresponding volume on England; in the Appendix
(C 6894, xxiv) all reports of commissions from 1870 onwards are
analysed. Lastly, since 1890 the annual *Agricultural Statistics of
Ireland* have contained a detailed table of current daily wages in
two hundred districts.

The conditions of engagement of labour in Ireland are, and
have been, very different from those which prevail in England or
Scotland, and there appear to be at least six classes of labourers :
the *cottier*, who obtains a house and a considerable area of land at a
reduced rent, and works for the same employer at a regular small
wage throughout the year; the *bound* labourer, who undertakes to
work at a fixed rate when required, and pays a higher rent for his
plot; the *out-labourer*, corresponding to the Scotch day labourer,
who competes for employment in the open market, is constantly
employed in good seasons, and has no special privileges, but may
or may not receive food as part of his wages; the *casual* labourer,
who obtains work when and at what wage he can; the man who
hires land on the *con-acre* system, working on it and growing his
own potatoes when farm-work is slack, and paying back the rent
by so many days' labour in busy seasons, who is closely allied to
the cottier; and the *farm servant*, living with the farmer on the
conditions that prevail in Scotland. Besides these, shepherds,
ploughmen and cattlemen are often paid at special rates. Materials
hardly exist for determining the relative numbers of these classes
at different dates or places.

The most valuable information relating to the total earnings of different classes is the following from the statistical account of the county of Meath, 1802 (pp. 342—44) :—

Meath, 1802. *The Cottier.*

Expenditure.	£	s.	d.	Receipts.	£	s.	d.
House and potato land	1	10	–	135 days at 5d.	2	16	3
Cow's grass and hay	2	–	–	,, 7d.	3	18	9
Summer's meal (5 cwt.)	2	16	10½	Profit on calf	2	–	–
1 rood flax land and seed	2	5	6	,, pig	1	10	–
Beef at Christmas	1	2	9	50 lbs. butter	1	5	–
Turf : 20 kishes	1	–	–	30 ,, yarn (after supplying the family)	1	12	6
Wool : 1 stone	–	18	–				
Soap, candles, tobacco	1	2	9		13	2	6
Shoes	–	15	–	To be provided by wife..	–	8	4½
	13	10	10½		13	10	10½

This is the only complete account I have found of the cottier's income. Details given in the " Devon " Commission in 1845 show that very similar conditions prevailed in the neighbouring county of Louth in 1845.

Meath, 1802. *The Bound Labourer.*

Expenditure.	£	s.	d.	Receipts.	£	s.	d.
Cow's grass	2	16	10½	135 days at 8d.	4	10	–
,, hay	1	10	–	,, 10d.	5	12	6
Potato land	3	8	3	Other receipts as cottiers	6	7	6
Other expenses as cottiers	11	10	10½		16	10	–
				To be provided by wife	2	16	–
	19	6	–		19	6	–

From this it appears that the cottier's privilege in reduced rent was estimated at 5l. 15s. 1½d. This should rightly be added to his earnings, which thus come to 19l.; and the value of the flax consumed at home should also be added, say 20l. in all.

Meath, 1802. *The Out-Labourer.*

Expenditure.	£	s.	d.	Receipts.	£	s.	d.
House rent	1	10	–	40 days' harvest at 1s. 3d....	2	10	–
Potato land	3	8	3	,, potato work at 1s. 1d.	2	3	4
Flax land and seed	2	5	6	50 days, various, at 1s.[14]	2	10	–
Meal, beef	3	19	7½	A winter task	1	–	–
Turf	1	–	–	30 lbs. yarn	1	12	6
Wool	–	18	–	Profit on pig	1	10	–
Soap, &c.	1	2	9				
Shoes	–	15	–		11	5	10
Kitchen for his potatoes....	1	10	–	To be provided by wife	5	3	3½
	16	9	1½		16	9	1½

[14] Original gives " fifty days at 10d. = 2l. 10s."

Throughout the century Meath appears to have been nearly the median and the average county with respect to wages. We may therefore take these annual earnings: cottier, 20*l.*; bound labourer, 16*l.* 10*s.*; out-labourer, 11*l.* 6*s.*; as typical of Ireland in 1802. With them we may put the only other general estimates extant:—

Average Labourer: Inglis, 1834.

	£	s.	d.
Four months at 8*d.*	3	9	4
Two　　„　　(seed and harvest) 1*s.*............	2	12	–
Six months out of work...............	6	1	4

This corresponds to 8*l.* 3*s.* 4*d.* earned in 1802, and the profits on home industry are to be added.

At the same date Drummond estimates average annual earnings at 5*l.* 17*s.* He obtains this total in the following way: "(The figures show) an average employment of about twenty-two weeks, of six working days each, to the whole of the labourers on hire, who are therefore destitute of employment during thirty weeks in the year. If about eight weeks or forty-eight days be added to the employment of labourers who hold land; and of fourteen days, for the employment on their con-acre ground, be added to the work of those labourers who take con-acre, the average amount of employment obtained during the whole year by the entire class of labourers will be 166 days. This at the (calculated) rate of 8½*d.* per day, gives an average of 2*s.* 3*d.* per week during the whole year for the earnings of each labourer, and amounts to 5*l.* 17*s.*"

A somewhat similar calculation given by a witness in 1830 appears to give 6*l.* 10*s.* as the annual wage.

Notice that labour spent on the labourer's land must be valued as earnings, whether he receives it rent free, or pays the rent by unpaid work at another time; and that when the land is rent-free the value of the rent must be also added to his earnings. To all these estimates of this period of distress and want of work should be added the value of home industries, a diminishing quantity through the first half of the century, and the profits on pigs and poultry whether consumed at home or not.

From Mr. W. P. O'Brien's evidence before the *Committee on Financial Relations between Great Britain and Ireland,* 1894, we gather that, previous to 1870, for a great part of the year no work was to be obtained, while there was increasing difficulty in renting land on whose produce to subsist during the slack season; but that by 1894 conditions had greatly improved: "wages are higher, and what is probably of more importance, employment is more constant, owing to the great emigration which has taken place among the class of able-bodied men. Their food is cheaper than it was fifteen years ago, and their house accommodation (in Leinster and Munster at all events) has undergone considerable improvement; and carrying with them, as they do, those plots of ground, they are enabled to keep pigs and fowls to provide them with food during the months they can get no employment."

Most of the above discussion does not refer to Ulster.

The "Richmond" Commission affords evidence that the ordinary labourer received 18*l.* per year;[15] while the reports of the Labour Commission indicate 25*l.* 5*s.* as the average annual earnings.

We may therefore make the following approximate tabulation for the earnings of the out-labourer, who appears to perform the bulk of the agricultural labour in Ireland:—

```
                £
1802  ...........  8 + (profits on home industry, pig and poultry) 3l.
 '34  ...........  6 + (          ,,               ,,           ) ?
 '80  ...........  18
 '93  ...........  25
```

The low wage of 1834 must have continued throughout the forties and fifties, with perhaps a little improvement as the effects of the famine passed away.

It will be observed that this estimate does not show the same rate of increase as that presently to be given for weekly wages; and in a final compilation the question will arise whether the special conditions of work in Ireland make it necessary to depart from the rule of estimating earnings on the basis of constant work, and allowing for irregularity of employment as a separate estimate.

Information as wages of farm servants is very deficient. What there is points to the following figures:—

Annual Wages in Addition to Board and Lodging: Men.

1800-10.	1830.	1850.	1870.	1890.	
£	£	£	£	£	
7	5	6	11	13	

The following table, based on the Labour Commission, completes the available estimates of total annual earnings:—

	1893.			
	Ordinary Labourer.		Farm Servant.	
	£ £ s.		£ s.	
Ulster	25 or 13 – and food		15 15 and board and lodging	
Leinster	25 ,, 12 5 ,,		12 – ,, ,,	
Munster	28 ,, 17 15 ,,		12 – ,, ,,	
Connaught	23 ,, 12 5 ,,		10 10 ,, ,,	
Ireland	25 ,, 13 10 ,,		13 – ,, ,,	

[15] Professor Baldwin says that "if you take all Ireland, the average wages of the agricultural labourer would not be more than 7*s.* a week, including everything."

Weekly Wages of

	1	2	3	4	5	6
	1777.	1801-10.	1829.	1833-40.	1845.	1850.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Leitrim	4 3	4 6	5 6	4 –	4 –	3 6
Sligo	3 6	6 –	5 –	3 6	4 –	4 2
Mayo	2 7	4 –	4 6	3 6	4 –	5 2
Roscommon	3 –	—	4 6	4 –	3 9	3 3
Galway	3 –	—	4 –	3 6	3 9	4 2
Connaught { Average	3 3	4 8	4 8	3 8	3 11	4 1
Connaught { Index number	35	51	51	40	43	45
Clare	3 –	—	4 –	4 –	4 –	5 –
Kerry	3 –	—	4 –	4 –	4 –	5 –
Cork	3 1	4 –	4 –	4 –	4 –	5 –
Limerick	3 –	—	5 –	3 6	4 –	5 –
Tipperary	3 –	—	4 6	3 6	4 –	4 2
Waterford	3 3	—	4 9	4 6	4 –	4 6
Munster { Average	3 –	4 4	4 4	3 11	4 –	4 9
Munster { Index number	31	43	43	39	40	47
Kilkenny	3 6	4 6	5 –	4 6	4 6	5 –
Wexford	6 6	—	5 –	5 –	4 9	5 –
Carlow	4 6	—	5 –	5 –	5 3	5 –
Wicklow	4 –	6 –	5 –	4 6	5 –	5 –
Kildare	4 –	6 –	5 6	5 –	5 6	5 –
Queen's Co.	3 6	—	5 –	4 6	4 6	5 –
King's Co.	2 6	—	4 6	4 –	4 3	4 –
West Meath	4 –	—	5 –	4 3	4 6	4 9
Longford	4 –	—	5 –	3 –	3 6	4 6
Meath	3 9	4 6	5 –	4 6	5 –	4 10
Dublin	5 –	8 6	7 6	5 6	6 –	5 1
Louth	4 –	—	5 6	4 6	5 –	5 8
Leinster { Average	4 1	5 3	5 3	4 6	4 10	4 11
Leinster { Index number	39	50	50	43	46	47
Monaghan	3 –	5 6	4 8	5 –	4 6	5 8
Cavan	3 –	5 6	5 –	4 6	4 –	4 3
Fermanagh	4 –	6 –	6 –	5 –	4 9	3 9
Donegal	3 6	5 6	6 –	6 –	6 –	3 9
Tyrone	3 –	4 6	6 –	5 –	5 –	5 4
Londonderry	2 9	6 6	5 6	6 –	5 –	5 –
Antrim	3 6	6 –	6 –	6 –	6 –	7 –
Down	3 6	4 3	6 –	5 6	6 –	5 8
Armagh	3 –	6 6	5 –	5 –	6 –	5 8
Ulster { Average	3 3	5 7	5 7	5 4	5 3	5 1
Ulster { Index number	31	53	53	51	50	48
Ireland { Average	3 6	5 1	5 1	4 6	4 8	4 10
Ireland { Index number	34 to (37)	50 to (54)	50 to (54)	44 to (48)	46 to (50)	47 to (51)

* The figures in the columns are based respectively on the following authorities :—
Commission ; 6 and 8. Poor Law Inspectors ; 7. Returns of Wages, 1830-86 ; 9. "Richmond"
Commission ; 13. Agricultural Statistics.

Note.—Figures in these types

*Ordinary Day Labourers.**

7	8	9	10	11	12	13	
1862.	1870.	1880.	1881.	1886.	1893.	1894.	
s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	
6 4	8 –	—	6 –	7 6	7 6	9 –	Leitrim
6 2	8 2	8 2	—	10 –	7 –	9 –	Sligo
6 –	8 2	7 6	—	9 6	9 6	9 –	Mayo
10 2	6 7	6 –	—	6 9	9 –	9 –	Roscommon
6 5	8 2	7 –	—	8 –	8 –	10 –	Galway
7 –	7 10	7 –		8 4	8 2	9 2	Average } Connaught
76	85	84		91	100	100	Index number
7 –	7 6	9 8	—	9 8	9 6	9 6	Clare
7 –	8 3	9 –	—	9 –	10 6	11 –	Kerry
7 8	9 –	10 6	—	10 –	10 6	10 –	Cork
8 4	8 3	12 –	12 –	9 6	10 6	11 –	Limerick
6 6	6 9	7 6	6 6	9 6	9 6	11 6	Tipperary
4 6	9 –	8 6	9 –	8 9	9 6	10 6	Waterford
6 10	8 1	9 6		9 5	10 –	10 7	Average } Munster
68	80	95		94	100	105	Index number
5 7	7 6	9 5	—	9 9	9 –	10 6	Kilkenny
6 3	7 6	8 5	—	8 9	9 –	9 –	Wexford
7 –	7 6	9 –	—	8 6	9 6	10 –	Carlow
9 6	7 6	8 8	—	9 –	10 6	9 6	Wicklow
8 –	7 2	10 –	—	10 –	10 6	12 6	Kildare
6 –	7 2	7 3	—	7 6	9 6	12 –	Queen's Co.
7 8	6 7	6 9	—	8 6	9 6	10 6	King's Co.
7 –	7 2	9 –	—	10 6	8 –	9 6	West Meath
7 –	7 2	8 8	—	9 –	8 –	10 –	Longford
7 9	7 10	—	9 –	9 6	9 6	11 3	Meath
8 9	7 10	11 6	—	12 –	10 –	15 3	Dublin
6 –	8 6	—	9 6	9 8	9 6	12 6	Louth
7 2	7 5	9 –		9 5	9 5	11 –	Average } Leinster
68	70	95		90	100	105	Index number
7 –	8 6	—	9 –	9 –	9 –	11 –	Monaghan
7 1	6 11	—	9 –	9 –	9 –	10 6	Cavan
6 –	8 –	10 –	10 –	9 4	7 6	11 6	Fermanagh
6 10	7 6	7 6	10 –	9 –	10 –	10 6	Donegal
7 5	8 –	—	10 –	9 6	11 –	11 –	Tyrone
7 6	7 6	13 6	11 –	11 –	11 –	10 6	Londonderry
9 6	11 –	—	11 –	11 –	11 –	13 6	Antrim
7 9	8 6	10 6	10 –	10 8	11 –	10 6	Down
7 5	8 6	—	9 6	10 –	9 –	10 –	Armagh
7 5	8 3	10 –		9 10	9 10	11 –	Average } Ulster
70	79	102		93	100	105	Index number
7 2	7 10	9 –		9 4	9 5	10 8	Average } Ireland
70 to (76)	77 to (83)	(88) to 95		92 to (99)	100	104	Index number

1. A. Young; 2. Statistical Accounts; 3. Commission, 1830; 4. Drummond; 5. "Devon" Commission; 10. "Bessborough" Commission; 11. "Cowper" Commission; 12. Labour

2 3 and 6 – are interpolated.

Mr. O'Brien estimates total earnings as 24*l.* 14*s.* if wages are paid continuously, and as 21*l.* if they are not paid in bad weather. 25*l.* in the table is based on arithmetic averages of the various rates paid in the counties, and may include too many at wages higher than the average. 28*l.* for Munster seems excessive. There appears to be room for a 10 per cent. error in this estimate of the average.

The only class of labourers for whose wages details can be generally found is that of the out-labourer, and here material is plentiful, though heterogeneous. When a simple statement is made that, *e.g.*, the daily wage is 8*d.*, this sum may mean the average throughout the year, either allowing or not for bad weather, or the winter, the spring, the summer, or the harvest wage, all different amounts; it may be the summer or winter wage of the cottier, the bound, casual, or out-labourer; it may be net, or include a valuation for food, or be paid in addition to food; it may carry with it a house, garden, potato land, turf, milk, any or all of these; it seems as though it might bear almost any relation to actual average earnings. On the other hand, it is often possible to tell from the context which of all these is signified, and considerable care has been exercised to make the statements strictly homogeneous and comparable. The average most easily obtained is the net average of the out-labourer's summer and winter wages, out of which he must pay rent for all the land he has, and in addition to which he obtains no measurable perquisites. In single statements there is often considerable doubt as to the significance of the figures; but when, as is especially the case with the figures given in Cols. 4, 8, 11, and 13, an average has been taken from many separate statements, not inconsistent with each other, we are on much safer ground. The average of nine statements may be supposed to have three[16] times the precision of a single statement; the average of the 200 separate items which give the general figure for 1894, has fourteen times the precision of the wage for a single district. Thus, if in examining statements of wages, we exclude those which are obviously far below the general rate, owing to the non-valuation of food, or far above, because they are only harvest statements, and if we value food and house-rent when there is evidence that they were free, we shall as we extend the scope of our average get nearer and nearer the fact. If, then, the original items may, any of them, be 2*d.* wrong in a daily wage of 8*d.*, an outside estimate, the county average, generally depending on as many as four statements, will probably be right to 1*d.* in 8*d.*, the provincial averages to $\frac{1}{2}d.$ or $\frac{1}{4}d.$ in 8*d.*; and the country average right within 1*d.* per week! Unfortunately in many cases we have not so many items as four for a county, they are not always random selections, and difficulties of weighting enter; while a much greater error creeps in in the comparison of column with column, for in some of them definite hypotheses are made throughout as to the number of weeks for which different rates

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[16] For the precision of an arithmetic mean increases as the square root of the number of terms comprising it.

obtain, and these not being the same in different columns, an un-corrected difference arises. Thus Cols. 9, 10, and 12 appear to represent the weekly wages which can be obtained throughout the year, while Cols. 2, 5, 6, 7, 8, 11, and 13 are based on the arithmetic average of summer and winter rates. As in the case of the English figures, it is necessary to take this into account when forming index-numbers. Now there is no evidence for a change of more than 4 per cent. between 1893 and 1894. The averages from the Irish agricultural statistics are as follows :—

Averages of the Highest and Lowest Winter and Summer Day Wages.

	1890.	1891.	1893.	1894.	1895.
	s. d.	s. d.	s. d.	s. d.	s. d.
Connaught	1 5½	1 6	1 6	1 6	1 6
Leinster	1 8	1 8½	1 9	1 10	1 9
Munster	1 7	1 8	1 8	1 9	1 7½
Ulster	1 8½	1 9	1 9	1 10	1 9
Ireland	1 8	1 8	1 8½	1 9	1 8

The differences between Cols. 12 and 13 are then half due to differences of averaging. If we allowed four months for the average summer wage in 1894 (2s.) and eight months for the average winter wage (1s. 6d.), the annual average would be 1s. 8d. instead of 1s. 9d. in 1894, and 1s. 7d. (9s. 6d. per week) in 1893; that is, we should obtain exact correspondence with the Labour Commission figures. Our plan is therefore to assume that Col. 12 gives the true wage in 1893, and Cols. 9 and 10 are directly comparable with it, taking the index for 1893 to be 100; that for 1894, allowing for the 1d. daily increase shown, will be 104; and with this Cols. 2, 5, 6, 7, 8, and 11 are directly comparable. The index numbers for the provinces and the country have been calculated on these principles; but for the country an alternative number has been given in brackets, since it is not absolutely with which of the values, that in Col. 12 or that in 13, they are strictly comparable. It is worth noticing that the further we go back the less difference appears. For Col. 4 we must bear in mind the statements already made as to Drummond's estimate. Col. 3 is from the Grand Jury's Presentment, and their statement leaves doubtful whether the figures stand for the wages in 1829, the date of publication, or for the whole period 1794—1822; the figures are therefore printed in the type (*123*) which I have taken as meaning of doubtful date, as are also the scattered figures in Col. 2 from the *Statistical Accounts.* Young's figures in Col. 1 appear to be as comparable in method with those of Col. 13 as the great interval of time allows. From his account the daily wage in 1756 was 5d., which would give index number 25. All daily wages have been converted into weekly by the factor 6. Interpolation has been carried out on the methods already explained.

The question of addition to earnings by harvesting in England

is of some importance, both with respect to actual and comparative earnings; but material hardly exists for any estimate. In 1881 it is reported that about 2 per cent. of all employed in agriculture increased their income in this way; and so small a proportion can hardly affect the average, except perhaps for Connaught, whence most of the migration takes place. The total number of migratory labourers decreased 30 per cent. between 1881 and 1893.

There remains to complete this study of agricultural wages, the estimation of actual annual earnings year by year for each country, and their combination into a single average for the United Kingdom.

V.—*Notes on Economical and Statistical Works.*

The Right to the Whole Produce of Labour. By Dr. Anton Menger. Translated by M. E. Tanner. cxvi + 271 pp., 8vo. 6s. net. London: Macmillan and Co., 1899.

The essay of Dr. Menger, now presented to the English public in a familiar tongue, is accompanied by a preface by Professor Foxwell, and a bibliography of the writings of the English Socialist School from the same competent hand.

In his preface, Professor Foxwell provides a historical sketch of the English School of Socialists, which will be welcomed by students of this phase of English thought, and admirably fills a serious gap in previous writings on socialism. Dr. Menger engages in the task of tracing the development of the doctrine of the right to the whole produce of labour, and criticises the various presentations of the doctrine by socialist writers from the point of view of Jurisprudence. He shows clearly the absolute incompatibility of the claim for this right with the claim to the right to subsistence. He considers what changes would be necessary to give legislative expression to these claims, concluding that of the three systems of private property with separate usance, community of property with separate usance, and community of property with community of usance, the full realisation of the right to the whole produce of labour is not practicable except under the second.

How useful such a discussion of the tendencies of socialist claims is, must be obvious. Where two principles struggle for precedence, and are widely regarded as similar in tendency, to realise that they are contradictory is a great gain. In his desire to avoid revolutionary methods of reform we may fully sympathise with the author, even if the particular political schemes he deprecates be affected largely by the conditions of his own country, and the case appear different in our own.

The vindication of the originality of the English school, and its history from the pen of Professor Foxwell, are very welcome features of the book. The contributions of the English Professor to the volume are not less important than those of the Austrian. In the conclusion of his introduction he properly directs attention

to the difficulties attendant on the use of phrases like "product of one's labour" and "unearned income." Dr. Menger regards the cessation of the latter as the necessary condition of the establishment of the right to the former. In view of the nebulosity of the ideas on which Professor Foxwell comments, we may readily agree that "doctrines of abstract right are apt to be double-edged." The immediate conditions certainly justify the statement that the interference of the State should be directed towards securing that "the economic conditions should be favourable to fairness and equality in bargaining," rather than, as Dr. Menger urges, to preventing any fresh creations of "unearned income" or the transference of such income from one class to another.

Le Recensement Séculaire du Monde en 1900. Par Dr. Joseph Körösi. 34 pp., imp. 8vo. Paris: Guillaumin et Cie., 1898.

We have been unable to direct attention previously to Dr. Körösi's communication to the St. Petersburg Congress of the International Statistical Institute, owing to a mishap by which we failed to receive the copy sent us. The memoir is an important one, its principal aim being to direct attention to the great need for the attainment of greater uniformity in the reduction of census figures for publication, so as to facilitate international comparisons. The attainment of a very high degree of uniformity in the questions asked may be rendered much less serviceable than circumstances permit, by neglect of precautions in the official work of reduction and publication. How great is the want of comparability at present between the figures of different countries is shown in an elaborate table. In the matter of age alone, we have countries stating ages year by year; others stating them at certain ages in groups of five years, at other ages in groups of ten years; while the point where the tabulation year by year ends varies much from country to country. Renewed attention to this matter of unification of the records is needed just now, and Dr. Körösi has contributed a very able memoir to the discussion of the subject. He further supplements his general plea for action by submitting a series of tables showing what might be adopted as a general form for publishing the records.

The Federal Census. Critical Essays. By Members of the American Economic Association. 516 pp., 8vo. $2. New York: Macmillan and Co. March, 1899.

This formidable volume contains a score of essays on different points connected with the American census by as many writers, each of whom offers criticism and advice for the improvement of the forthcoming twelfth census of the United States. A committee of the American Economic Association has gathered these essays and edited them. While they were in the press, the law determining the scope and organisation of the twelfth census passed through Congress, and it is given as an appendix in parallel columns with the corresponding act of ten years ago. A number of extracts from letters received by the committee, in answer to inquiries made of others than the authors of the essays, are also

included.   The essays deal in great part with details of the
American census, which cannot be of any wide general interest,
except to specialists, on this side; but they also treat of certain
general matters applicable to other countries, and hence will
preserve a general interest when the special matters relating to
the twelfth census no longer occupy attention.   The writers
include Mr. Worthington C. Ford, Professors Carl C. Plehn,
Irving Fisher, Richmond Mayo-Smith, and others equally well
fitted to treat of the special subjects entrusted to them.   Their
essays may perhaps at some time find easier access to those most
interested in them in separate form.

Paysans et Ouvriers depuis sept cents ans.   Par Vicomte G.
d'Avenel. 391 pp., 8vo. 4 frs. Paris: Armand, Colin, et Cie., 1899.
       The elaborate investigations of the Vicomte d'Avenel into prices
and wages during past centuries in France, have been noticed in
this *Journal.*   The present work is one of several in which the
author converts the heavy material of the more scientific publica-
tions into more readable form, weaving a history of the condition
of the working classes out of the threads supplied by his tables of
prices.   He claims to prove that the " iron law " of wages has no
historical justification, but that, up to the present century, wages
were determined by the relation of population to the area of
available land.   These determining influences have been modified
by the application of scientific discovery to productive purposes in
the nineteenth century.   The regulations of governments or of
combinations have not, he says, been able to add to the welfare
of those affected.   The means of such addition is a question of
science, not of politics.   The mode of expression may be somewhat
too rigid, the assignment of scientific progress as an element in
general welfare too narrowly stated in confining it to our own
century, but the broad outlines of the actual picture resemble
sufficiently closely those of this brief sketch of the author.
       In presenting figures of wages, he employs the calculations of
purchasing power of money he previously made to present in an
approximate equivalent in the currency of modern France the
wages of former times.   This facilitates the reading and compre-
hension of his facts, and is satisfactory if we accept as accurate the
basis of his calculations of purchasing power.   This must be
mentioned, because of the difficulties attaching to satisfactory
measures of the purchasing power of money.
       A volume so crammed with facts does not lend itself readily to
a brief statement of its contents.   It stands for France in the
relation in which Rogers's "Six Centuries" stands to England.
Like the latter, it abounds in acute observations suggested by or
bearing on the subject matter.   It is a book which should be
widely and carefully read.

The Temperance Problem and Social Reform.   By Joseph
Rowntree and Arthur Sherwell.   626 pp., 8vo.   London: Hodder
and Stoughton, 1899.
       The appearance of this volume is opportune at a time when

the conflicting reports of the different sections of the Royal Commission, presided over by Lord Peel, are coming before the public. In part it is a recapitulation of an oft-told tale of excessive indulgence in alcoholic drinks and the manifold evils which follow on such excess. The stress laid on the political influence of the trade is not too pointed, even though some of the modes adopted for illustrating the possible effect on parties in the House of Commons may be open to question. The danger of such influence on politics is sufficiently serious, and the influence seems to be growing at a sufficiently alarming rate not to need, or render desirable, an appeal in a form which is addressed practically to one party alone.

Various modes of combating the admitted evils of alcoholic excess are considered. The policy of prohibition is examined in much detail, and the case against it which is made out is extremely strong. State monopoly and high license are also considered but not approved, on the whole, especially the latter. The company system of Norway and Sweden is the one in which the authors find most which commends itself to them. They lay much stress on the degrading effects of bad housing and overcrowding on the poorer sections of urban populations, and point to means of remedying, or applying some antidote to, these effects as an essential part of their solution of the problem. They dissociate themselves from any plan of combining rational amusement with the sale of drink in the hope of reducing the stimulus to take excessive amounts. The carrying on of the trade under arrangements modelled on Scandinavian experience, dissociating the sale from profit as its first and sole aim, and applying whatever profits accrue in part to the provision of such healthy recreation as may disincline to the consumption of alcoholics, provided, too, in entire dissociation from that sale: such are the outlines of their proposals.

Nearly one-third of the volume is devoted to appendices, containing more and more detailed statistics bearing on the question than those quoted in the text. One point in these statistics appears open to question, namely, where international comparisons are instituted as to the total amount of alcohol consumed country by country. Is it well to assume that the average alcoholic strength of wine consumed in a country like France, can be placed as high as in every other European country except Italy and the United Kingdom? The resulting calculation of *per capita* consumption of alcohol probably places France in too unfavourable a light. Another point strikes us, because of the attention directed to the comparison between the three Scandinavian countries. So far as concerns the one to which the greatest consumption of alcoholics is assigned, taxed and untaxed beer are included together in the beer consumed. As more than 60 per cent. of this was tax free, is it just to estimate its alcoholic strength at 4 per cent.? One can hardly avoid doubting whether spirits have escaped, where wine and beer have been measured by doubtful standards. The scale of alcoholism which would result from using less arbitrary factors of reduction might well differ a

good deal from that stated, but it would demand a very careful investigation for its establishment on a satisfactory basis.

The question of where nations stand in relative devotion to alcohol is not one vital to the main purpose of the book, however, for the problem we have to face is one in our own country, and the bearing of foreign experience on a practical solution is not in any high degree dependent on the precision of these factors in the calculation of the strength of the liquors they consume.

Introduzione alle Economica Matematica. Dei Professori F. Virgilii e C. Garibaldi. 210 pp., 12mo. 1·50 lire. Milano: Ulrico Hoepli, 1899.

The authors aim, in this little book, at going beyond what Dr. Irving Fisher attempted in his manual, which was issued when the English version of Cournot's celebrated work appeared. They include in their work an introduction to algebra, trigonometry, and analytical geometry, before offering the reader anything dealing with differential or integral calculus. They aim, in fact, at meeting the wants, not merely of readers whose previous acquaintance with mathematics enables them to appreciate the methods of the infinitesimal calculus, but of those who need to be led up to that point from a more elementary stage. We think that their aim is good, and their plan more likely to meet the case of students desiring to equip themselves so as to master the writings of mathematical economists. At the same time, it is permissible to doubt whether any very useful study of economics can be made with the aid of mathematical symbols by those whose equipment of mathematical knowledge is strictly limited to the bare minimum—that is, whether the average person untrained in mathematics can gain much by endeavour to use tools which will almost certainly never become really familiar to him. This little volume may, nevertheless, help to the understanding of the writings of others, even if it do not equip students to push investigations of their own by mathematical methods.

An introduction gives a summary critical sketch of the history of the application of mathematics to economic science, and a bibliography.

Geschichte des Englischen Handels. Von Percy Rudolph Broemel. 111 pp., crown 8vo. 1s. London: Andrews Brothers, 1899.

In this small volume the author aims at giving a sketch of English commercial history from the days of the Phœnicians. As far as the middle ages the sketch occupies a single page, and in less than five-and-twenty pages more the date of the Reform Bill is reached. It is clear, therefore, that the facts of the present century form the main theme of the book. For a sketch of trade history from early times the volume indicates rather too clearly its author's eagerness to be up to date in his facts, and to utilise the latest sources of information on the most recent occurrences. It may, however, realise one of its author's wishes, if the brief outline here given induce readers to make a more careful study of so important and even fascinating a subject.

Statistical and Economical Articles in Recent Periodicals.

UNITED KINGDOM—

Economic Journal. March, 1899—Ought Municipal Enterprises
to be allowed to yield a profit?: E. Cannan. Is the English
system of taxation fair?: C. P. Sanger. The investment of
surplus revenue: D. Renton. Protective tariffs in Australia
and New Zealand: W. P. Reeves. Futures in the Grain
Market: H. C. Emery. State Railways and State Revenue
in Prussia: G. Cohn. The Norwegian system of regulating
the Drink Traffic: A. T. Kiær. The Chinese Salt Trade:
E. H. Parker. On a Point in the Theory of International
Trade: F. Y. Edgeworth. Wages in the United States and
Europe: A. L. Bowley.

Economic Review. April, 1899—English Wages and Foreign
Competition: H. W. Blunt. Saving and Spending:—I. A
criticism: A. W. Flux. II. A reply: J. A. Hobson. The
Workmen's side of the new Trades Combination Scheme:
E. J. Smith.

Journal of the Statistical and Social Inquiry Society of Ireland.
December, 1898—Greater Dublin: Extension of the Municipal
Boundaries: C. Dawson. Neglected Children and Neglectful
Parents: E. D. Daly. The coming change in Irish Local
Government: W. J. Johnston.

UNITED STATES—

Annals of the American Academy of Political and Social Science—
March—The Regulation and Nationalization of the Swiss
Railways: H. Dietler (concluded in May). Wealth and
Welfare. III: H. H. Powers. Political and Municipal
Legislation in 1898: E. D. Durand.

May—A Function of the Social Settlement: J. Addams.
Tendencies in Primary Legislation: W. J. Branson.

Supplement to May—The Foreign Policy of the United
States: Political and Commercial.

American Economic Association:—
Publications. New Series, No. 2—The Federal Census.
Critical Essays.

Economic Studies. Vol. iv, No. 2—Personal Competition:
C. H. Cooley. Supplement—Handbook of the Association,
with Report of Annual Meeting, 1898.

American Statistical Association. Publications—
December, 1898—Considerations in gathering Forestry Statis-
tics: B. E. Fernow.

March, 1899—Contributions to the study of Wage Statistics:
C. J. Bullock. A Year of State Deficits: W. C. Ford.
Census of 1900. Vital Statistics of the War with Spain.

Johns Hopkins University Studies. Series xvii, Nos. 4 and 5—
History of the Know Nothing Party in Maryland: L. F.
Schmeckebier.

UNITED STATES—*Contd.*

Journal of Political Economy. March, 1899—The charge for railway mail carriage : *G. G. Tunell.* The development of Credit : *C. A. Conant.* Industrial Democracy : *C. Zueblin.* Some social applications of the Doctrine of Probability : *O. Ammon.* Further data of Anthropo-Sociology : *C. C. Closson.*

Political Science Quarterly. March, 1899—England and her Colonies. I : *J. Davidson.* The Sugar Situation in Europe : *J. F. Crowell.* Taxation of Securities : *F. W. Taussig.*

Quarterly Journal of Economics. April, 1899—The Theory of Savers' Rent and some of its applications : *C. W. Mixter.* The study of practical labor problems in France : *W. F. Willoughby.* Can we keep a Gold Currency ? : *C. F. Dunbar.* The Twelfth Census : *C. D. Wright.*

Yale Review. May, 1899—A French Colonial Experiment in the Far East : *H. E. Bourne.* Taxation of Mortgages in California : *C. C. Plehn.*

FRANCE—

Annales des Sciences Politiques, 1899—

March—Les Protectorats de l'Inde Britannique : *J. Chailley-Bert (concluded in May).* Nos droits à Terre-Neuve : *E. Bourgeois.* La colonisation libre en Nouvelle-Calédonie : *E. Payen.*

May—Le problème africain dans l'hémisphère austral : *R. G. Lévy.* La situation économique des manufactures américaines : *P. de Rousiers.* La question du crédit agricole : *D. Zolla.*

Journal de la Société de Statistique de Paris, 1899—

April—La baisse du prix des transports aux États-Unis d'Amérique : *E. Levasseur.*

May—La progression des valeurs successorales au xixᵉ siècle : *E. Besson.* L'avenir économique de l'Espagne et du Portugal : *E. Rochetin (concluded in June).*

June—Observations sur la statistique successorale : *A. Coste.* La carte électorale de l'Empire allemand : *P. Meuriot.*

La Réforme Sociale. Nos.—

74—L'Idée et le sentiment de la Patrie en France et à l'Étranger *(concluded).* L'Évolution du Trade-Unionisme : *A. Gigot.* Grèves et Co-opératives : *J. M. Langeron.*

75—Les ennemis de notre progrès économique : *G. Blondel.* La petite propriété dans le Département de l'Orne en 1789 : *L. Duval (continued in No.* 76).

76—Le suffrage universel en Belgique, son organisation, ses résultats : *A. Nerincx (continued in No.* 77). Les Co-opératives en Belgique : *O. Pyfferoen.*

77—Les forges de Nijni-Taguil en 1844 : *F. Le Play.*

78—De la Bourgeoisie et de l'émigration aux Colonies : *J. B. Piolet.* Une enquête sur les logements, professions, salaires et budgets dans le Quartier de la Pointe-d'Ivry : *Dr. Mangenot (continued in No.* 79).

79—Un projet de loi sur les associations sans but lucratif : *Hubert-Valleroux.*

FRANCE—*Contd.*

    Journal des Économistes, 1899—

        April—Les finances italiennes : *D.B.* Le marché à terme en grains à Londres : *A. E. Sayous.*

        May—La réforme de l'enseignement dans nos écoles de Droit et la tradition du Droit romain : *E. Martineau.* La mine aux mineurs : *E. Ratoin.* Les Banques d'émission suisses : *G. François.*

    Revue d' Économie Politique, 1899—

        March—Les associations professionnelles de l'avenir : *E. de Girard.* La théorie de la rente foncière de Karl Marx : *N. Slepzoff.* Essai sur les variations du taux de l'escompte : *F. S. Nitti (concluded).*

        April—Les villes tentaculaires : *E. Vandervelde.* Le genèse de l'argent : *C. Favre.* Les groupements féministes en France : *C. Turgeon.* La productivité du travail et les salaires : *L. Dechesne (continued in May).*

        May—Les Associations ouvrières de production : *H. Blancheville.*

GERMANY—

    Archiv für Soziale Gesetzgebung und Statistik. Hefte 5 *und* 6—Der neue Entwurf eines Invalidenversicherungsgesetzes in Deutschland : *Dr. E. Lange.* Die sozialen Zustände in der Seidenindustrie der Ostschweiz : *Dr. F. Schuler.* Die Steuerprogression : *Dr. C. Heiss.* Die Ursachen der Erwerbsunfähigkeit nach dem deutschen Invaliditäts- und Altersversicherungsgesetz : *Dr. E. Lange.* Die französischen Arbeiterausstände der Jahre 1893-97 : *Dr. F. Aurin.*

    Jahrbuch für Gesetzgebung, Verwaltung, &c., 1899. *Heft* 2—Die im engeren Sinne sociale Kriminalstatistik als Statistik der Rechtsgüterverletzungen : *K. Seutemann.* Über das deutsche Geldwesen im Kriegsfall : *M. Ströll.* Die obligatorische Krankenversicherung der Hausindustriellen : *O. Weigert.* Deutschlands landwirtschaftlicher Betrieb nach den Ergebnissen der mit der Berufs- und Gewerbezählung vom 15 Juni, 1895, verbundenen landwirtschaftlichen Aufnahme : *P. Kollmann.* Die wirtschaftliche Lage auf Sardinien : *M. Claar.* Entwickelung und gegenwärtige Organisation der englischen Fabrikinspektion : *H. Simon.* Die Organisation des Fremdhandels in China : *H. Schumacher.* Lebensversicherung, Kapitalversicherung und die ländliche Bevölkerung unter vorzugsweiser Berücksichtigung des mittleren und kleineren Grundbesitzes der Provinz Brandenburg : *H. Grandke.*

    Jahrbücher für Nationalökonomie und Statistik, 1899—

        March—Die chinesischen Vertragshäfen, ihre wirtschaftliche Stellung und Bedeutung : *H. Schumacher.* Der Begriff "Sozialpolitik" : *L. von Bortkiewicz.* Die Frequenz der deutschen Universitäten von 1831/32—1898/99.

        April—Die Grundrententheorie im ökonomischen System von Karl Marx : *K. Diehl.* Zur Erkenntnislehre der volkswirtschaftlichen Phänomene : *S. Grabski.* Der Arbeitsnachweis im Handelsgewerbe : *J. Silbermann.*

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Jahrbücher für Nationalökonomie und Statistik, 1899—*Contd.*

May—Die Entwickelung der Kindersterblichkeit in den europäischen Staaten: *F. Prinzing.* Die Entwickelung des Preisniveaus in den letzten Decennien und der deutsche Getreidebedarf in den letzten Jahren: *J. Conrad.* Die deutsche Spielwarenindustrie: *F. Zahn.*

Vierteljahrshefte zur Statistik des Deutschen Reichs. 1899. *Heft* 2— Bei den deutschen Börsen zugelassene Werthpapiere im Jahre 1898. Erzeugnisse der Bergwerke, Salinen und Hütten im Jahre 1898. Verkehr auf den deutschen Wasserstrassen in 1872 bis 1897. Bestand der deutschen Fluss-, Kanal-, Haff- und Küstenschiffe am Schluss den Jahre 1877, 1882, 1887, 1892 und 1897. Statistik der Krankenversicherung (1897 und 1892/97). Zur Statistik der Streiks und Aussperrungen.

Zeitschrift für Socialwissenschaft, 1899. *April*—Die organische Methode in der Sociologie: *E. Zenker.* Der kollektive Arbeitsvertrag: *T. S. Cree (concluded in May).* Die Ursachen der Erwerbsunfähigkeit nach dem deutschen Invaliditäts- und Altersversicherungsgesetz: *Dr. W. Kley.*

Zeitschrift für die gesamte Staatswissenschaft, 1899. *Heft* 2— Der Staat und sein Boden. I Grundlegung: *Dr. A. Schäffle.* Die Lage des Schuhmacherhandwerks in Deutschland. II: *Dr. E. Fridrichowicz.* Entwurf eines Reichsgesetzes über die privaten Versicherungs- Unternehmungen: *Dr. R. Einhauser.* Das französische National-Exportamt: *Dr. A. E. Sayous.* Der gewerbliche Arbeitsvertrag und seine Beschränkungen: *J. Nothhardt.*

AUSTRIA—

Statistische Monatschrift. January — February, 1899—Ernte-Ergebnisse der wichtigsten Körnerfrüchte im Jahre 1898. Die Zwangsarbeits- und Besserungs- Anstalten in Oesterreich und die Ergebnisse ihrer Wirksamkeit im Jahre 1897: *Dr. J. Winckler.* Die statistische Erhebung der Allgemeinen Arbeiter- Kranken- und Unterstützungscasse in Wien für die Zwecke der Angehörigenversicherung: *Dr. R. Fuhrmann.*

ITALY—

Rivista Italiana di Sociologia. March — I problemi della sociologia: *V. Pareto.* Del concetto d'uguaglianza nelle dottrine politiche del Confucianesimo: *C. Puini.* La psicologia della folla: *V. Miceli.* L'interesse del denaro nell' antichità: *E. Ciccotti.*

Giornale degli Economisti. 1899—

March—Il profitto del capitale tecnico: *C. A. Conigliani.* Le migrazioni del lavoro agli Stati Uniti d'America: *C. Ottolenghi (continued in April).* La protezione dell' agricoltura nella riforma doganale Leopoldina: *A. Morena.*

April—Il lavoro umano e la macchina: *A. Graziadei.* Il quarto censimento italiano: *G. B. Salvioni and L. Bodio.*

ITALY—*Contd.*

   Giornale degli Economisti. 1899—*Contd.*

      May—L'origine del Baratto : a proposito di un nuovo studio del cognetti : *M. Pantaleoni (continued in June).* La partecipazione dello Stato ai profitti delle Banche di Emissione : *P. Des Essars.* Margarina economica : *V. Pareto.*

      June—Profili statistici delle nazionalità in Austria-Ungheria : *A. Niceforo.* Gli zuccheri di barbabietola e la finanza : *R. Cavalieri and B. Stringher.* Scioperi in Italia e all' estero nel 1897 : *A. Bertolini.*

RUSSIA—

   Bulletin Russe de Statistique financière. January—March, 1899— Liste, par ordre d'importance de leur capital nominal, des 239 sociétés par actions exploitant l'industrie minérale ou métallurgique. Capital-actions, &c.—Production des métaux et minerais communs et de la houille en 1897.—Production et prix du sel.—Naphte. Quantités de "résidus" expédiées de Bakou en 1891—1897. Prix par tonne métrique.—Chemins de fer russes. Nombre de verstes ouvertes au trafic, année par année, de 1838 à 1898.—Détails sur les monnaies russes frappées tant en Russie qu'à l'étranger de 1892 à 1898.— Monnaies d'or étrangères se trouvant dans la Banque de Russie au 1er janvier, 1895, et au 1er janvier, 1899.—Production du sucre comparée de l'Allemagne de la France et de la Russie pendant les 12 dernières compagnes.—La consommation de l'alcool en Russie. Provinces où le monopole des spiritueux sera prochainement en vigueur.

VI.—*Quarterly List of Additions to the Library.*

Additions to the Library during the Quarter ended 15th June, 1899, *arranged alphabetically under the following heads :*—(a) *Foreign Countries ;* (b) *India and Colonial Possessions ;* (c) *United Kingdom and its Divisions ;* (d) *Authors, &c. ;* (e) *Societies, &c. (British) ;* (f) *Periodicals, &c. (British).*

The Society has received, during the past quarter, the current numbers—either quarterly, monthly, or weekly—of the periodical official publications dealing with the following subjects :—

Consular Reports—From Austria-Hungary, Portugal, United States, and United Kingdom.

Labour Reports, &c.—From Belgium, France, United States, New Zealand, and United Kingdom.

Trade Returns—From Argentina, Austria-Hungary, Belgium, Bulgaria, China, Egypt, France, Germany, Greece, Italy, Mexico, Netherlands, Russia, Spain, Sweden, United States, India, Canada, and United Kingdom.

Vital Statistics—From Argentina, Egypt, Germany, Italy, Netherlands, Roumania, Switzerland, United States (Connecticut and Michigan), Queensland, South Australia, and United Kingdom.

Vital Statistics of following Towns—Buenos Ayres, Brünn, Prague, Brussels, Copenhagen, Berlin, Dresden, Hanover, Bucharest, Madrid, Montevideo, London, Manchester, Dublin, Edinburgh, and Aberdeen.

Donations—Contd.

Donations.	By whom Presented (when not purchased).
(a) Foreign Countries.	
Argentine Republic—	
Anuario de la Direccion General de Estadistica correspondiente al año 1897. Tomo ii. 8vo......................	The Director-General of Statistics
Austria-Hungary—	
Arbeitsstatistisches Amt. Protokoll der zweiten Sitzung des Arbeitsbeirathes . . . 1898. 188 pp. 8vo.	The Austrian Labour Department
Bewegung der Bevölkerung im Jahre 1896. Fol.........	
Durchschnittspreise von Weizen, Korn, Gerste, Hafer, und Mais in Marktorten. (Current monthly numbers.) Sheets	The Central Statistical Commission
Handels. Statistik des auswärtigen, des österr.-ungarn. Zollgebiets. Jahr 1897. Band 3 (Vormerkverkehr-Durchfuhr). 8vo.	The Statistical Department, Ministry of Commerce
Statistische Nachrichten aus dem Gesammtgebiete der Landwirtschaft. (Current numbers)	The Central Statistical Commission
Statistische Monatschrift. (Current numbers)	
Tabellen zur Währungs-Statistik. 2ᵉ Ausgabe. Hefte 7–9. 3 parts, fol. 1898-99	The Ministry of Finance
Hungary—	
Eisenbahnen der Länder der Ungarischen Krore in 1894-96. Fol. 1899.....................	The Central Statistical Bureau of Hungary
Ungarisches statistisches Jahrbuch. Neue Folge. V. 1897. 8vo.	
Bukowina. Mittheilungen des statistischen Landesamtes des Herzogthums Bukowina. Heft 7. 1899.	The Statistical Bureau
Belgium—	
Mines. Annales des. Tome iv. Livr. 2. Année 1899	The Belgian Labour Department
Brussels. Annuaire Démographique et Tableaux statistiques des Causes de Décès. Année 1898	Dr. E. Janssens
Bulgaria—	
Mouvement de la Population dans la Principauté pendant 1896. 4to.	The Statistical Bureau
China—	
Customs Gazette. Oct.—Dec., 1898	Sir Robert Hart, Bart., G.C.M.G.
Medical Reports for half-year ended 30th Sept., 1898	
Lighthouses, Light-Vessels, &c. List for 1899. Maps	
Returns of Trade and Trade Reports for 1898	
Denmark—	
Communications de Statistique, 4ᵉ Serie, tome 4. (Récolte en 1898, Prix officiels des céréales en 1898, Importation et Exportation en 1898). 8vo.	The State Statistical Bureau
Nationalökonomisk Tidsskrift, 1899. (Current numbers)	The Danish Political Economy Society
Egypt—	
Finances. Compte général du Gouvernement égyptien pour l'Exercice 1898. Fol.	Sir Elwin M. Palmer, K.C.M.G.
Institut Égyptien. Bulletin. (Current numbers)........	The Institute

Donations—*Contd.*

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(a) Foreign Countries—*Contd.*

France—

Agriculture. Bulletin du Ministère de l'. Année 1899. (Current numbers) .... } The Ministry of Agriculture

Chemins de fer français. Statistique des, au 31 Déc., 1897. Documents principaux. Maps, 4to. .... } The Ministry of Public Works

Commerce de la France avec ses colonies et les puissances étrangères. Tableau décennal du, 1887-96. 2 vols., diagrams, la. 4to. .... } The Director-General of Customs

Finances, Ministère des. Bulletin de Statistique et de Législation comparée. (Current monthly numbers.) } The Ministry of Finance

Recensement des Industries et Professions . . . . 29 Mars, 1896. Résultats statistique du, Tome i. Introduction. Region de Paris au nord et à l'est. 15 departments. 845 pp., 4to. 1899...................... } The French Labour Department

Dictionnaire du Commerce, de l'Industrie, et de la Banque. Livr. 6, 7. 8vo. 1899 .... } The Publishers

Annales des Sciences Politiques. (Current numbers)....   ,,

Économiste Français. (Current weekly numbers) .... The Editor

Journal des Économistes. (Current monthly numbers) .... }   ,,

Monde Économique. (Current weekly numbers)............   ,,

Polybiblion. Revue Bibliographique Universelle. Parties Littéraire et Technique. (Current monthly numbers) .... }   ,,

Réforme Sociale. (Current numbers) ....   ,,

Rentier. Journal Financier Politique. (Current numbers) .... }   ,,

Revue d'Économie Politique. (Current monthly numbers) .... }   ,,

Revue Géographique internationale. (Current numbers) .... }   ,,

Revue de Statistique. Recueil hebdomadaire. . . . (Current numbers.) 8vo. .... } The Publisher

Musée Social. Circulaires, &c. (Current numbers.) Concurrence ou Cooperation. Conference de *M. Gide*. No. 4, April, Ouvriers des Chemins de fer aux États-Unis. No. 5, May, Marins-pêcheurs à Terre-Neuve et Islande. Obsèques du Comte de Chambrun, Fondateur du Musée Social, 1821-99. 4to. } The Institution

Société de Statistique de Paris. Journal. (Current monthly numbers) .... } The Society

Germany—

Gesundheitsamtes. Veröffentlichungen des Kaiserlichen. (Current numbers) .... } The Imperial Health Bureau

Kriminalstatistik für das Jahr 1897. Tabellenwerk.

Reichstagswahlen. Statistik der, von 1898. Theil 2, diagrams, 4to. ....

Vierteljahrshefte zur Statistik des Deutschen Reichs. Jahrgang 1899. Heft 2. 4to. .... } The Imperial Statistical Bureau

Prussia—

Berufszählung, 1895. Hauptergebnisse der, Theil 1. (142-I)...

Ernteertrages. Ergebnisse der Ermittelung des, für 1897. (154.) 2 diagrams .... } The Royal Prussian Statistical Bureau

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Donations.	By whom Presented (when not purchased).
(a) Foreign Countries—*Contd.*	

Germany—*Contd.*

Prussia—Contd.

Geburten, Eheschliessungen, und Sterbefälle während 1896 und 1897. (149 and 155.) 2 vols.	
Grundeigenthum und Gebäude, 1893. (146–I.) 2 diagrams	
Schulwesen im Jahre 1896. Gesammte niedere, (151–I, II.) 2 vols.	The Royal Prussian Statistical Bureau
Sterblichkeit nach Todesursachen und Altersklassen der Gestorbenen . . . 1896. (152)	
Viehzählung, 1897. Ergebnisse der. (153)...........	
Volkszählung, 1895. Endgultigen Ergebnisse der, Theil 2. (148–II.) 1898......................................	
Zeitschrift des K. Preussischen Statistischen Bureaus. Vierteljahrsheft 1, 1899	

Frankfort—

Beiträge zur Statistik der Stadt. Ergänzungsblatte. Nos. 1 und 4, Volkszählung, 1895. 2, Statistik der Krankenkassen. 3, Berufszählung, 1895. 5, Erhebung über die Wohnungsverhältnisse, 1895. 6, Gewerbezählung, 1895. 6 parts. 4to.	The Municipal Statistical Bureau
Mittheilungen aus der Handelskammer. (Current numbers)	The Chamber of Commerce
Magdeburg. Der Magdeburger Wohnungsmarkt, 1894-98. 59 pp. Diagrams, 8vo. 1899	Sir R. W. Rawson, K.C.M.G., C.B.

Wörterbuch der Volkswirtschaft . . . herausgegeben von Prof. Dr. Ludwig Elster. 2 vols., la. 8vo. Jena, 1898	Purchased
Archiv für Soziale Gesetzgebung und Statistik. Band xiii, Hefte 5 und 6. 1898	The Publisher
Jahrbuch für Gesetzgebung, Verwaltung, und Volkswirtschaft. Heft 2, 1899.............................	The Editor
Jahrbücher für Nationalökonomie und Statistik. (Current monthly numbers)	The Publisher
Zeitschrift für die gesamte Staatswissenschaft. Heft 2, 1899..	The Editor
Zeitschrift für Socialwissenschaft. (Current monthly numbers)	,,

Italy—

Annali di Agricoltura, 1898. No. 219, Atti della Commissione per la Pesca, 1898. 8vo.	
Bilanci comunali per 1897 e situazioni patrimoniali dei Comuni al 1 gennaio, 1897. 8vo.	
Emigrazione italiana. Statistica della, avvenuta nel 1897 e confronti coll' emigrazione dagli altri Stati d'Europa per l'America. 8vo...............................	
Morte. Cause di, Statistica dell' anno 1897. 8vo.	The Director-General of Statistics
Postale e Telegrafico. Relazione statistica intorno ai servizi, per l'esercizio 1896-97 ed al servizio delle casse postali di Risparmio per l'anno 1896. Fol.	
Scioperi. Statistica degli, avvenuti nell' Industria e nell' Agricoltura durante 1897. 8vo.	
Tabella indicante i valori delle merci nell' anno 1898 per le Statistiche commerciali. 8vo.	

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(a) **Foreign Countries**—*Contd.*

Italy—*Contd.*

L'Economista. (Current weekly numbers) .... The Editor

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Rivista Italiana di Sociologia. Fasc. 2, 1899 .... ,,

Mexico—

Anuario Estadistico de la Republica, 1897. La. 8vo. Estadistica fiscal. Importacion. Año fiscal de 1895-96. 2 vols. Diagrams, fol. 1899 .... The Statistical Bureau

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Statistica agricola. (Evaluations provisoires des cultures et récoltes et vignes pour 1897-98.) 7 pp. 4to. .... The Statistical Bureau

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Budget de l'Empire. Règlement définitif pour l'Exercice 1897. Rapport par le Contrôleur de l'Empire. 8vo. .... The Controller of the Empire

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Prices of rye and oats in European Russia. Diagram-maps showing. (Current monthly numbers)............ Department of Commerce and Industry

Servia—

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Spain—

Sociedad Geográfica de Madrid. Boletin y Revista de Geografia colonial y mercantil. (Current numbers) .... The Society

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Arbetsstatistik. I. Undersökning af Bagerierna i Sverige. 8vo. 1899 .... The Central Statistical Bureau

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Betänkande angående minderårigas antagande och användande i fabrik . . . 8vo. 1877 ....

Bidrag till Utvandringsfrågan från Befolkningsstatistisk synpunkt. 338 pp., 8vo. Upsala. 1885-86....

Bidrag till kännedomen om Förgiftningarna i Sverige, 1873-92. 117 pp. 8vo. Upsala. 1893 ....

Dödlighets-, premie- och Vinstberäkningar inom Lifförsäkringsteorien . . . 71 pp. 8vo. 1893 ....

Dödsorsakerna och Dödligheten i Helsingborg, 1876-90. Diagrams, 4to. 1894 ....

Tyfoidfebern i Sverige. Historia, Geografi, och Statistik. Diagrams, 4to. 1898 .... The Royal University of Upsala

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Underdånig Berättelse angående Kongl. Patentbyråns Verksamhet, 1885-88 and 1885-94. 2 parts. 8vo.

Handlingar rörande utredning angående fiskeri-befolkningens i Göteborgs ... Sm. 4to. 1898.......

Handels- och Sjöfartskomiten. II. Sjömanshusen. 8vo. 1898 ....

Den Inre Omflyttningen. I. Norrland. 59 + xxv pp. 8vo. Malmo. 1897 ....

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Underdånigt betankande angående reglering af Oregel-bundenheter . . . 1882. xxxv + 496 pp. 8vo.

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Agriculture. Department of. Bulletin. No. 14. Trade of Philippine Islands. 1898. Crop Circular for May, 1899. Report on Wages of Farm Labor in the United States in 1840-92. (Miscell. Series No. 4, 1892.) Report on Winter Grain, and losses of farm animals during 1898-99, with statistics of Foreign crops. (New Series, No. 156) ....

The Department of Agriculture

Consular Reports, Special. Sericulture and Silk reeling from Cocoons by machinery. Cultivation of English Walnut. Vol. xv, Part 2. 8vo. 1899....

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Canal Statistics. Traffic through the Suez, Kaiser Wilhelm, Canadian, St. Mary's Falls, and New York Canals. 4to. 1898...

Colonial Systems of the World. Map, 4to. 1898 ....

Exports of Domestic Merchandise, 1898. 4to. ....

Foreign Commerce of United States, 1898. Review of, Map, 4to. ....

Foreign Commerce and Navigation of United States for 1897-98. Parts 1 and 2. Diagrams, 4to. ....

Imports of Merchandise, 1898. 4to. ....

The Bureau of Statistics, Treasury Department

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(a) Foreign Countries—*Contd.*	
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Imported Merchandise entered for consumption in United States, and duties collected thereon, 1826-98 ; and amounts of drawback paid on Imports used in manufacture of articles exported, 1898. 4to.............	The Bureau of Statistics, Treasury Department
Debt. Monthly Statements of the Public, and of Cash in Treasury. (Current numbers.) Sheets...............	
Finance. Annual Reports of the Secretary of the Treasury on the State of the Finances for the years 1897 and 1898. 2 vols. 8vo.	The Secretary of the Treasury
Gold, Silver, and Notes, &c., in Circulation, and Changes in Money and Bullion in the Treasury. Monthly Statements. (Current numbers.) Sheets	
Mineral Resources, 1897. Metallic products, coal and coke ; nonmetallic products, except coal and coke. 2 vols. La. 8vo. Plates	The Director, U.S. Geological Survey
Review of the World's Commerce . . . during 1898. 8vo. 1899	The Department of State.
Statistical Abstract of the United States. 1898. 21st number. 8vo...	The Treasury Department
Connecticut. 21st Report of the Board of Health for 1898, with Registration Report for 1897. Diagrams.	The Board of Health
Illinois. Coal in Illinois, 1898, containing Annual Reports of State Inspectors of Mines. 8vo.	The Bureau of Labour Statistics
Kansas. Bureau of Labor and Industrial Statistics. 13th Annual Report, 1897. 8vo.	The Bureau of Labor
Massachusetts—	
State Board of Arbitration and Conciliation. 13th Annual Report for 1898. 8vo................................	The Board
Metropolitan Water Board. Fourth Annual Report for 1898. 8vo.	,,
Nebraska. Bureau of Labor and Industrial Statistics. 6th Biennial Report for 1897 and 1898.	The Deputy Commissioner
New Jersey. Bureau of Statistics of Labor and Industries. 20th Annual Report for 1896-97. 8vo.	The Bureau
Boston. Annual Report of Executive Department for 1897. 2 vols. Thick 8vo. 1898	The Department of Municipal Statistics
New York. Public Library. Bulletin. (Current numbers)	The Library
Banker's Magazine and Rhodes' Journal of Banking. (Current monthly numbers)	The Editor
Bradstreet's. (Current weekly numbers)	,,
Commercial and Financial Chronicle. (Current weekly numbers, with supplements)..	,,
Engineering and Mining Journal. (Current numbers)	,,
Journal of Political Economy. Vol. vii, No. 2, 1898	The Publisher
Library of Economics and Politics. Municipal Monopolies, a collection of Papers by American Economists and Specialists. Edited by *E. W. Bemis.* 691 pp. Sm. 8vo. 1899	,,
Political Science Quarterly. Vol. xiv, No. 4, 1899........	,,
Quarterly Journal of Economics. Vol. xiii, No. 3, 1899	,,
Yale Review. Vol. viii, No. 1. May, 1899	The Editor

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American Academy of Political and Social Science. Annals. Vol. xiii, Nos. 2 and 3; also Supplement. The Foreign Policy of the United States: Political and Commercial. 216 pp., 8vo. 1899	The Academy
American Economic Association—	
Economic Studies. Vol. iv, No. 2, 1899, and Supplement............. .... Publications. New Series. No. 2. The Federal Census. Critical Essays . . . March, 1899	The Association
American Geographical Society. Bulletin. Plates. (Current numbers)	The Society
American Statistical Association. Quarterly Publications. New Series. No. 45, March, 1899.................	The Association
American Philosophical Society. Proceedings. No. 158. December, 1898	The Society
American Public Health Association. Bertillon Classification of Causes of Death. . . . 40 pp., 8vo. 1899	The Association
John Crerar Library [Chicago]. Fourth Annual Report for 1898. 8vo.	The Librarian
Johns Hopkins University Studies. Extra volume, xx. Financial History of Baltimore: *J. H. Hollander.* Series xvii, Nos. 4 and 5. History of the Know Nothing Party in Maryland: *L. F. Schmeckebier.* 8vo. 1899	The University
Leland Stanford junior University. Register for 1898-99. 8vo...	,,
Sound Currency Committee. Leaflets, &c. 8vo. 1899....	The Committee
Smithsonian Institution—	
Report of Board of Regents of the U.S. National Museum for 1895-96. Plates. 8vo. .... Report of Board of Regents for 1896-97. Plates .... Smithsonian Miscellaneous Collections, No. 1170. Bibliography of Chemistry, 1492-1897: *H. C. Bolton.* 1st Supplement, 8vo. 1899	The Institution
Uruguay—	
Anuario Estadistico de la Republica. Año 1897. Plates and diagrams. La. 8vo.	The Statistical Bureau
International—	
Bulletin International des Douanes. (Current numbers.) 8vo.	The Board of Trade
(b) India and Colonial Possessions.	
India, British—	
Trade by Rail and River in India in 1897-98, and the four preceding years. 10th Issue. Fol.	The Statistical Bureau
East India Railway. Diagrams of Traffic, audited 2nd half-year of 1898. Fol.	The Company
Bengal—	
Report on the Administration of Bengal, 1897-98. General Report on Public Instruction in Bengal for 1897-98. Maps. Fol.	The Lieut.-Governor of Bengal
Indian Engineering. (Current weekly numbers)............	The Editor

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Proceedings. (Current numbers) .... ⎬ The Society	
Kacmiracabdamrta. Part 2, 8vo. 1898 .... ⎪	
Bombay Branch of Royal Asiatic Society. Journal. ⎪	
Vol. xx, No. 54. 1898 .... ⎭	
British South Africa Company—	
Information as to Mining in Rhodesia. 216 pp. ⎫ Sir Ernest Clarke	
Maps. 4to. 1899 .... ⎭	
Canada, Dominion of—	
Sessional Papers: Session 1898: Vols. 1, Auditor- ⎫	
General. 3, Insurance. 4, Trade and Commerce. ⎪	
5, Trade and Navigation. 6, Inland Revenue, Agri- ⎪	
culture, Farms. 7, Archives, Criminal Statistics, ⎪	
Agriculture and Dairying. 8, Public Works, Rail- ⎪	
ways and Canals. 9, Marine and Fisheries, Hudson's ⎪	
Bay .... ⎪	
Agriculture. Report of Minister of, for 1898 .... ⎪	
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Chartered Banks. Shareholders in, at 31st Dec., ⎪	
1898 .... ⎪	
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Diagrams showing Progress of Canada, 1868-98........... ⎬ Sir John G. Bourinot,	
Estimates for year ending 30th June, 1900 .... ⎪ K.C.M.G., LL.D.	
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Report of Secretary of State for 1898 .... ⎪	
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Yukon. Maps, 1898 .... ⎭	
Banks. Monthly Reports on Chartered. (Current ⎫ Mr. N. S. Garland,	
numbers) .... ⎬ F.S.A.	
Report of Dividends remaining unpaid and unclaimed ⎪	
balances in chartered banks, 1898 .... ⎭	
The Chronicle. Insurance and Finance. (Current num- ⎫ The Editor	
bers) .... ⎭	
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Civil Service List and Calendar, 1899. Map, 8vo. .... ⎫ The Colonial Secre-	
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(Advance copy) .... ⎭	
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Australasian Statistics, 1898. Population and Vital Statistics. 8 pp. 8vo.	
Statistical Register for 1898. Parts 1, Public Finance. 2, Local Government. 3, Shipping...........................	
Meteorology. Results of rain, river, and evaporation observations during 1897. Maps, &c.	
Mines and Agriculture. Annual Report of Department of, for 1897. Fol.	The Agent-General for New South Wales
Postmaster-General. Annual Report for 1897. Fol.	
Statistical Account of the Seven Colonies of Australasia, 1897-98. 8vo.	
Statistical Register for 1897 and previous years............	
New Zealand—	
Government Insurance Recorder. (Current numbers)	The Government Insurance Department
Wellington—	
Harbour Board. Accounts, &c., for 1898. Fol.	The Board
Chamber of Commerce. Report for 1898. 8vo.	
New Zealand Trade Review and Price Current. (Current monthly numbers)	The Editor
Straits Settlements—	
The Perak Government Gazette. (Current weekly numbers)	The Government Secretary
Victoria—	
Abstract of Statistics of Victoria, 1893 to 1898. 37 pp., 8vo. Melbourne, 1899....................................	The Assistant Government Statist
(c) United Kingdom and its several Divisions.	
United Kingdom—	
Coal Tables. Production and Consumption of Coal in Principal Countries, 1883-97. (118.) 1899	Dr. B. W. Ginsburg
Emigration and Immigration from and into the United Kingdom in 1898. (188.) 1899	The Board of Trade
Mines and Quarries. General Report and Statistics for 1898. Part 1. District Statistics. [C—9272]....	The Home Office
Railway Accidents. Returns of, during 1898 . . . [C—9260.] Plans. 1899	The Board of Trade
Trade and Shipping of Africa. Maps. [C—9223.] 8vo. 1899	
Board of Trade Journal. (Current monthly numbers)	
Gas Undertakings (Local Authorities). (365.) 1898	Purchased
Index to Parliamentary Papers. Session 1897. (418)	
Liquor Licensing Laws. Royal Commission on. Minutes of Evidence, &c. Vol. 8. [C—9075.] 1898	
Local Government Act, 1888, Commission. Report of Commissioners and Minutes of Evidence . . . [C—6839] and [—i]. 1892	

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Tramways (Street and Road). (355.) 1898	
Great Britain—	
Agriculture. Journal of the Board of. Vol. v, No. 4, March, 1899.......	} The Board of Agriculture
England and Wales—	
Annual Summary of Births, Deaths, and causes of Death in London and other large towns, 1898	} The Registrar-General of England
Births, Deaths, and Marriages. 60th Annual Report of Registrar-General of (1897). [C–9016]	
British Museum. Catalogue of Printed Books. (Current numbers.) 4to.	} The Trustees
Education. Report of Committee of Council on, 1897-98. [C–8987.] 1898	} Purchased
Judicial Statistics for 1897. Part 2. Civil Judicial Statistics. [C–9204.] 1899	} The Home Office
London. Technical Education Gazette. (Current numbers)	} The London County Council
Birmingham. Report on the health of the City for 1898, and on Adulteration of food and drugs	} The Medical Officer of Health
Bristol. Annual Report of Medical Officer of Health . . . 1898. Diagrams, 8vo.	,,
Cardiff. Annual Report on the Health of Cardiff for 1898. Fol., diagrams	,,
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Halifax. Report of Medical Officer of Health, with Reports of Sanitary Inspector and Borough Analyst for 1898. Diagram, 8vo.	,,
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Mersey Conservancy. Report on present state of navigation of the River Mersey, 1898. 8vo.	} The Conservancy
Ireland—	
Agricultural Statistics for 1897. [C–8885.] 1898	} Purchased
Local Government Board. 26th Annual Report for 1897-98. [C–8958.] Diagrams, 8vo. 1898............	
Scotland—	
Edinburgh. Accounts of the City published in 1898. Fol.	} The City Chamberlain
Aberdeen. Tubercular Disease. Suggestions for its prevention and control. 30 pp., 4to. 1899	} The Medical Officer of Health
(d) Authors, &c.	
Abbott (Samuel W.). Infant Mortality in Massachusetts. 19 pp., 8vo. Boston. 1898	} Mr. A. W. W. King

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Adams (Henry Carter). The Science of Finance. An Investigation of Public Expenditures and Public Revenues. xiii + 573 pp. 8vo. New York. 1898....	Messrs. Kegan Paul, Trench & Co.
Atkinson (Edward)—	
Criminal Aggression: by whom committed. 20 pp., 8vo. 1899	The Author
The Wheat Problem again. 18 pp., 8vo. 1899	
Avenel (Vicomte G. d'). Paysans et Ouvriers depuis sept cent ans. xvi + 391 pp., sm. 8vo. Paris. 1899	Purchased
Beaure (Auguste). Théorie et pratique de la Monnaie. Tome i, Traité théorique de la monnaie et statistique des métaux précieux. 144 pp., 8vo. Paris. 1899	,,
Beeton (Mayson M.). The Truth about the Foreign Sugar Bounties. The Case for Abolition. 168 pp., 8vo. Diagrams. 1898....................................	The Author
Biddle (D.). On Factorization. 33 pp., 8vo. 1898	,,
Booth (Charles). Old Age Pensions and the Aged Poor. A proposal. 75 pp., 8vo. 1899	,,
Bourouill (Baron d'Aulnis de). Les Primes à l'exportation du Sucre ... ix + 112 pp., 8vo. La Haye. 1899	,,
Broemel (Percy R.). Geschichte des Englischen Handels ... 111 pp. 8vo. London. 1899	,,
Carter (Roger N.). The Preparation of Profit and Loss Accounts for Income Tax Purposes. 23 pp., 8vo. 1899	,,
Cater (J. J.). Paper on Ancient Currency, Monetary Systems, and Ancient Banking 73 pp. Maps and Plates. 8vo. 1899	,,
Danvers (Fred. C.). On Coal, with reference to its Screening, Transport, &c. 103 pp., plates. 8vo. 1872	Dr. B. W. Ginsburg
Dückershoff (Ernst). How the English Workman Lives. By a German Coal Miner. viii + 97 pp., 8vo. 1899....	Messrs. P. S. King & Son
Duncker (Georg). Die Methode der Variationsstatistik. 65 pp. Diagrams, 8vo. Leipzig, 1899	Mr. Wilhelm Engelmann
Engelbrecht (Th. H.). Die Landbauzonen der aussertropischen Länder. 3 vols., maps, &c., la. 8vo. Berlin, 1899	The Author
Engelhardt (Alexander Platonovich). A Russian province of the North. [Archangel.] Translanted from the Russian by Henry Cooke. xix + 356 pp. Plates, &c., 8vo. 1899	Messrs. A. Constable & Co.
Ferraris, Carlo F.—	
La Scienza della Popolazione a proposito di recenti pubblicazioni. 16 pp., 8vo. 1898	The Author
Banken in Italien. 21 pp., 8vo. 1899	
Guyot (Yves). Les Accidents du Travail. 38 pp., sm. 8vo. Paris, 1899	Sir Rawson W. Rawson
Johnson (George). Mercantile Practice. 163 pp., 8vo. 1897	The Author
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Meyer (Robert). Die Ergebnisse der Einkommensteuer in Oesterreich. 18 pp., 8vo. Wien, 1899	Sir Rawson W. Rawson
Mulhall (Michael G.). Dictionary of Statistics. 4th edition, revised to Nov., 1898. Diagram. La. 8vo. 1899	Purchased

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Murray (*Adam*) and (*Roger N.*) *Carter.* Guide to Income-Tax Practice . . . 2nd edition. xxiv + 372 pp., 8vo. 1899	The Authors
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Pierson (*N. G.*). Leerboek der Staatshuishoudkunde. Vol. i and part 1 of vol. ii, la. 8vo. Haarlem, 1896-97	,,
Raffalovich (*Arthur*). Le marché financier en 1898-99. La. 8vo. Paris, 1899	,,
Rowntree (*Joseph*) and (*Arthur*) *Sherwell.* The Temperance Problem and Social Reform. xxii + 626 pp., diagrams, &c., 8vo. 1899	The Authors
Sharp (*Granville*). China, Anglo-America, and Corn. 36 pp., sm. 8vo. Hongkong, 1899	The Author
Stein (*Sigmund*). 1, Home grown beet sugar. 3 pp., 8vo. 1898. 2, Sugar beet growing in United Kingdom, 6 pp., 8vo. 1898. 3, Report on sugar beet growing in United Kingdom during 1898. 52 pp., 8vo. 1898. 4, England's "Attitude of Reserve" at the Brussels Conference, 1898. 8 pp., 8vo. 1898	,,
Stephens (*W. Walker*). Old age annuities for men and women, on a scheme attractive to the purchasers. 14 pp., 8vo. Edin., 1898	,,
Virgilii (*F.*) *et* (*C.*) *Garibaldi.* Introduzione alla Economia Matematica (Manuali Hoepli). xii + 210 pp., 12mo. Milano, 1899	M. Ulrico Hoepli
Webb (*Sidney and Beatrice*). Industrial Democracy. 2 vols., 8vo. 1897	Purchased
Whitelegge (*B. Arthur*). Hygiene and Public Health. viii + 588 pp., sm. 8vo. 1899	The Author
Wiener (*Charles*). La République Argentine. vii + 677 pp., la. 8vo. Paris, 1899	Purchased
Wilbur (*Cressy L.*). Mortality statistics of the eleventh Census. 13 pp., 8vo. 1899	The Author

(e) **Societies, &c. (British).***

British Economic Association. Economic Journal. March, 1899	The Association
Economic Review. Vol. ix, No. 2. April, 1899	The Publisher
Cobden Club. Leaflets. 1. Reasons against Countervailing Duties on Sugar, 1897. 2. Bounties on Sugar and Dangers ahead, 1897. 3. Sugar Bounty Conference, 1898. 4. The West Indian Agitation. 1898. 5. The Effects of Sugar Bounties, 1899. 6. Protection in India, 1899. 7. Sugar Bounties, Countervailing Duties and the West Indies, 1897. 116. Protection within the Empire : *Lord Farrer.* 117. The forgotten factor, or Producers v. Consumers : *Lord Farrer.* 118. Taxation of Commodities : *H. Cox*	The Cobden Club
East India Association. Journal. (Current numbers)	The Association

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Institute of Actuaries. Journal. Vol. xxxiv. Part 5, April, 1899	,,
Institute of Bankers. Journal. (Current numbers)........	,,
Institution of Civil Engineers. Minutes of Proceedings. Vol. 135. Plates, 8vo. 1899	The Institution
Lloyd's Register of British and Foreign Shipping— Statistical Tables, showing number, tonnage, and description of vessels . . . for 1890-98. 9 parts, 4to..... Shipbuilding Returns. Quarterly Returns, 1888-99, and Annual Summaries for 1892-98. Fol................ Vessels totally lost, condemned, &c. Quarterly returns, 1890-98, Annual Summaries for 1891-97	The Committee of Lloyd's
London Chamber of Commerce. Journal. (Current numbers)	The Chamber of Commerce
Manchester Literary and Philosophical Society. Memoirs and Proceedings. Vol. xliii, part 1, 1898-99	The Society
Medical Officers of Health. Incorporated Society of. Public Health. (Current monthly numbers.) 8vo.....	,,
Middlesex Hospital. Reports of the Medical, Surgical, and Pathological Registrars for 1897. 8vo.	The Hospital
Royal Agricultural Society. Journal. Third series. March, 1899...	The Society
Royal Asiatic Society. Journal for April, 1899	,,
Royal Colonial Institute. Journal for March, 1899 (containing Sir R. Giffen's Paper)	The Institute
Royal Geographical Society. Geographical Journal. (Current numbers.)	The Society
Royal Irish Academy. Transactions. Vol. xxxi, part 7. 4to. 1899	The Academy
Royal Meteorological Society. Quarterly Journal. Vol. xxii, No. 109. 1899	The Society
Royal Society. Proceedings. (Current numbers)	,,
Royal United Service Institution. Journal. (Current numbers)	The Institution
Sanitary Institute. Journal. April, 1899. 8vo.	The Institute
Society of Arts. Journal. (Current numbers)	The Society
Statistical and Social Inquiry Society of Ireland. Journal. Vol. x, part 78. December, 1898. 8vo.	,,
Surveyors' Institution— Professional Notes. (Current numbers) .... Transactions. (Current numbers)	The Institution

(f) **Periodicals, &c. (British).***

Accountant, The..	Current numbers	The Editor
Accountants' Magazine, The	,,	,,
Athenæum, The	,,	,,
Australian Trading World........................	,,	,,
Bankers' Magazine, The............................	,,	,,
Bimetallist, The	,,	,,

* Foreign and Colonial Periodicals will be found under the various Countries or Colonies in which they are issued.

REPORT OF THE COUNCIL

For the FINANCIAL YEAR *ended* 31st *December,* 1898, *and for the*
SESSIONAL YEAR *ending* 30th *June,* 1899, *presented at the*
SIXTY-FIFTH ANNUAL GENERAL MEETING *of the* ROYAL STA-
TISTICAL SOCIETY, *held at the Society's Rooms,* 9, *Adelphi
Terrace, Strand, London, on the* 30th *of June,* 1899.

THE Council have the honour to submit their Sixty-fifth Annual
Report.

The roll of Fellows on the 31st December last as compared
with the average of the previous ten years was as follows—

Particulars.	1898.	Average for the previous Ten Years.
Number of Fellows on 31st December	878	982
Life Members included in the above	180	176
Number lost by death, withdrawal, or default	57	64
New Fellows elected	43	55

Since the 1st January last, 40 new Fellows have been elected,
and the Society has lost 24 by death or resignation, so that the
number at present on the list is 894.

The Society has to deplore the deaths of the undermentioned
Fellows since June last year :—

	Date of Election.
d Adam, Robert	1879
Bickford-Smith, William, J.P.	1879
Blades, R. H.	1883
Colman, J. J.	1867
Davies, William H.	1874
Deloitte, William W.	1877
Doxsey, Rev. Isaac	1875
Ebbsmith, Joseph	1887
Evans, Henry Jones, J.P.	1879
Gairdner, Charles	1879
Galton, Capt. Sir Douglas, K.C.B., F.R.S......................	1873
d Hoare, Henry	1870

d Indicates those who had been Donors to the Library.

Date of Election—*Contd.*

Ionides, Alexander A.	1888
Miller, William	1879
Narraway, W. F.	1888
d Notthafft, Theodor	1878
d Peek, Sir Henry W., Bart.	1876
Powell, James Heslop	1888
Roberts, Sir William, M.D., F.R.S.	1890
Staples, Sir Nathaniel A., Bart.	1877
Tarling, Charles	1889

The financial condition of the Society is exhibited in the accompanying table, in which the particulars are contained for the twenty-five years 1874-98.

The papers read and the members elected at each of the ordinary meetings have been as follows:—

SESSION 1898-99.

First Ordinary Meeting, Tuesday, 15*th November,* 1898.

CHARLES BOOTH, Esq., Honorary Vice-President, in the Chair.

The following were elected Fellows:—

Sir Charles Thomas Dyke Acland, Bart.	Arthur William Waterlow King.
Edward Thomas Joseph Blount.	Arthur Michael Leveaux.
Sir James Blyth, Bart.	Percival C. Scott O'Connor.
William Roland Burton.	William George Renwick.
Frank Dever-Summers.	Richard George Salmon.
George William Victor Fisk.	Arthur Sherwell.
Thos. Edward Hayward, M.B., F.R.C.S.	William Alfred Teasdale.

Sydney Young.

Sir Henry Burdett, K.C.B., read a Paper on "Old Age "Pensions."

In the discussion which followed, the undermentioned took part:—Mr. E. W. Brabrook, Mr. F. G. P. Neison, Mr. R. P. Hardy, Mr. C. H. E. Rea, Mr. J. Kirk, Mr. G. U. Yule, Mr. C. Booth (Chairman), and Sir Henry Burdett in reply.

Second Ordinary Meeting, Tuesday, 13*th December,* 1898.

The Right Hon. LEONARD H. COURTNEY, M.P., President, in the Chair.

The following were elected Fellows:—

Albert Ebenezer Bone.	Cornelius Rozenraad.
Robert Martin Holland.	Matthew Thomas Wigham.
Charles Hewetson Nelson.	Herbert Wrigley Wilson.

d Indicates those who had been Donors to the Library.

Statement of the Condition of the Society in the last Twenty-five Years, 1874-98.

Year	Number of Fellows on 31st December	Number of Compounders included therein	Losses during Year by Deaths, &c.	Gains by Election, &c., during Year	Income from — Annual Subscriptions	Compositions	Journal Sales	Investments and other Sources	All Sources	Expenditure — Total	Of which — On Journal	On Library	Amount Invested on 31st December	Year
					£	£	£	£	£	£	£	£	£	
1874...	588	84	35	93	918	252	140	67	1,377	1,491	461	40	1,600	1874
'75...	607	87	31	50	928	105	133	65	1,231	1,733	449	18	1,271	'75
'76...	611	90	46	50	1,054	168	159	57	1,438	1,340	524	75	1,271	'76
'77...	683	101	40	112	1,117	252	151	77	1,597	1,476a	474	49	1,471	'77
'78...	746	115	45	108	1,197	294	169	72	1,732	1,849a	580	32	2,000	'78
'79...	783	119	52	89	1,300	126	176	96	1,698	1,808a	671	34	2,400	'79
1880...	808	129	49	74	1,317	273	202	110	1,902	1,806a	573	80	2,700	1880
'81...	807	130	45	44	1,306	84	145	114	1,649	1,697a	609	37	3,000	'81
'82...	786	135	63	42	1,291	189	227	131	1,838	1,782a	553	60	3,200	'82
'83...	860	139	41	115	1,361	126	150	141	1,778	1,943a	585	49	3,500	'83
'84...	909	150	57	106	1,447	294	207	1,198	3,146b	3,088c	645	38	2,500	'84
'85...	928	148	55	74	1,462	63	188	349	2,062d	2,970c	625	27	2,500	'85
'86...	943	156	70	85	1,583	231	180	92	2,086	2,106e	735	32	2,500	'86
'87...	977	160	59	93	1,621	126	188	94	2,029	2,135f	609	87	2,500	'87
'88...	1,059	172	58	140	1,686	334	171	101	2,292	2,003	711	58	2,500	'88
'89...	1,060	175	69	70	1,678	126	229	82	2,115	2,060g	623	146	2,500	'89
1890...	1,063	177	65	68	1,764	84	155	94	2,097	2,096a	567	68	2,900	1890
'91...	1,019	172	80	36	1,707	42	146	181	2,076h	1,957i	582	172	2,900	'91
'92...	994	171	70	45	1,634	84	158	104	1,980	1,883j	539	94	2,900	'92
'93...	964	176	66	36	1,560	124	128	92	1,904	1,921	578	63	2,900	'93
'94...	933	180	67	36	1,491	105	152	82	1,830	1,904	649	75	2,900	'94
'95...	928	180	59	54	1,468	63	180	82	1,793	1,823k	576	56	2,900	'95
'96...	910	181	48	30	1,478	42	168	84	1,772	1,787	571	44	2,900	'96
'97...	892	182	58	40	1,472	145	157	83	1,857	1,986l	650	50	2,900	'97
'98..	878	180	57	43	1,451	115	182	105	1,853	1,825	609	55	3,300m	'98

a Includes purchase of Government stock.   b Includes sale of 1,000l. stock.   c Includes expense of moving to new premises.

d Includes Dr. Guy's legacy of 250l.   e Includes cost of Jubilee Volume.   f Includes cost of Catalogue and Index, and of Charter.

g Includes cost of part iv of Index to Journal.   h Includes Mrs. Lovegrove's legacy of 100l.

i Includes outlay for Guy Medal and for binding the "Times."   j Includes outlay for drainage repairs.

k Includes cost of Subject-Index to Journal.   l Includes cost of doing up interior of premises.

m 2,900l. consols and 400l. G.N.R. stock, purchased with Mr. J. Heywood's Legacy of 500l.

The President delivered his Annual Address, " An Experiment " in Commercial Expansion."

A cordial vote of thanks to the President for his Address was moved by Sir Robert Giffen, K.C.B., seconded by Sir Francis Sharp Powell, Bart., M.P., and carried unanimously.

Third Ordinary Meeting, Tuesday, 17*th January,* 1899.

The Right Hon. LEONARD H. COURTNEY, M.P., President, in the Chair.

The following were elected Fellows :—

Henry Birchenough.	Nusserwanji Rustomji Mistri.
Sidney Stanley Dawson.	Sir Henry William Primrose.
Eustace Ingram.	Thomas Rhodes.
John Baker C. Kershaw.	James Sorley.

Sir Robert Giffen, K.C.B., read a Paper on " The Excess " of Imports."

In the discussion which followed, the undermentioned took part :—Mr. J. Samuel, Mr. John Glover, Mr. A. E. Bateman, Mr. W. Fowler, Mr. T. J. Pittar, Mr. S. Bourne, Mr. H. Birchenough, The President, and Sir Robert Giffen in reply.

Fourth Ordinary Meeting, Tuesday, 21*st February,* 1899.

Sir COURTENAY BOYLE, K.C.B., Vice-President, in the Chair.

The following were elected Fellows :—

Richard James Allen.	Baldwin Sydney Harvey.
Percy Rudolph Broemel.	Charles James L'Estrange.
Henry Hobson Finch.	Edward Robert P. Moon, M.P.
Charles H. F. Gordon.	John Edward O'Connor.

Isidore Wiener.

Mr. Price - Howell's Paper on " Comparative Statistics of " Australasian Railways " was read by the Assistant Secretary, the author being resident in Sydney, New South Wales.

In the discussion which followed, the undermentioned took part :—Mr. H. M. Paul, Mr. W. M. Acworth, Mr. P. de Jersey Grut, Sir Juland Danvers, Mr. M. Macfie, and Sir Courtenay Boyle (Chairman).

Fifth Ordinary Meeting, Tuesday, 21*st March,* 1899.

Sir ROBERT GIFFEN, K.C.B., Honorary Vice-President, in
the Chair.

The following were elected Fellows:—

Thomas John Barnardo.	Coghlan McLean McHardy.
Henry Anthony Hertz.	Niel Matheson MacWharrie.
Junichiro Suzuki.	

Mr. G. UDNY YULE read a Paper on " The Causes of Changes
" in Pauperism in England during the last two Intercensal
" Decades."

In the discussion which followed, the undermentioned took
part:—Professor F. Y. Edgeworth, Mr. N. A. Humphreys,
Mr. E. W. Brabrook, Mr. W. F. Sheppard, Mr. R. H. Hooker,
Mr. J. Argyle, Sir Robert Giffen (Chairman), and Mr. G. U. Yule
in reply.

Sixth Ordinary Meeting, Tuesday, 18*th April,* 1899.

RICHARD B. MARTIN, Esq., M.A., M.P., Honorary Treasurer,
in the Chair.

The following were elected Fellows:—

Mayson M. Beeton.	John Roxburgh Martin.
Gilbert Henry Claughton.	Robert Edward Turnbull.

A Paper by Mr. George Martineau on " The Statistical Aspect
" of the Sugar Question" was read, in the author's absence
through illness, by Mr. J. A. Baines, C.S.I., Honorary Secretary.

In the discussion which followed, the undermentioned took
part:—Sir Robert Giffen, Sir Henry Norman, Sir Nevile Lubbock,
Mr. C. Czarnikow, Mr. H. Cox, Mr. P. de Jersey Grut, Mr. H. de
Smidt, Mr. C. J. Crosfield, and Mr. R. H. Hooker.

Seventh Ordinary Meeting, Tuesday, 16*th May,* 1899.

Major P. G. CRAIGIE, Honorary Secretary, in the Chair.

The following were elected Fellows:—

Benoy Vehari Mukerji.	George Henry Richardson.
Henry Thomas.	

Dr. Carlo Francesco Ferraris, Professor of Administrative Science and Law
and of Statistics at the Royal University of Padua, was elected an
Honorary Fellow of the Society.

Mr. T. E. Hayward, M.B., read a Paper on "Life Tables: "their Construction and Practical Application."

In the discussion which followed, the undermentioned took part:—Mr. A. H. Bailey, Mr. N. A. Humphreys, Mr. R. Price-Williams, Mr. C. H. E. Rea, and Mr. T. E. Hayward in reply.

Eighth Ordinary Meeting, Tuesday, 20*th June,* 1899.

Major P. G. Craigie, Honorary Secretary, in the Chair.

The following were elected Fellows:—

Harold Dougharty.	Edward Morgan.
The Right Hon. Sir Henry Hartley Fowler, M.P.	James Muirhead Potter Muirhead.
	Benjamin Seebohm Rowntree.
John Martin Knights.	William Henry Tozer.
Sigismund Ferdinand Mendl, M.P.	Joseph Frederick Ward.

Professor A. W. Flux read a Paper on "The Flag and Trade."

In the discussion which followed, the undermentioned took part:—Mr. H. Moncreiff Paul, Professor R. Mayo-Smith, Mr. H. Birchenough, Mr. J. T. Taylor, Mr. P. de J. Grut, Mr. J. Barr Robertson, Mr. Sydney Young, Mr. F. W. Lawrence, Mr. R. H. Hooker, Mr. M. Macfie, Mr. J. Johnston, Major P. G. Craigie (Chairman), and Professor A. W. Flux in reply.

Although the events of the Session 1898-99 have not been of a very remarkable character, steady progress has been maintained in the ordinary work of the Society.

A new contract for the printing of the *Journal,* commencing with the first issue of the current volume, has been entered into with Messrs. Harrison and Sons, the Queen's Printers, who have for many years executed the Society's work to its entire satisfaction. Under the new arrangement a substantial monetary saving to the Society will, it is hoped, result, without the efficient manner in which the printing has been carried out being in any way impaired.

In connection with the *Journal,* also, it may be noticed that an agreement has been entered into with a firm of advertisement contractors, whereby it is expected that a good supply of high class advertisements will be assured for each issue. It is hoped that by this means, without in any way injuring the character of the Society's publications, a new and useful source of revenue may be opened up.

By the lamented deaths of Mr. James Heywood in 1898, and of Mr. John Biddulph Martin in 1897, the number of the trustees in whom the funds of the Society were vested has been reduced to one. Amongst the advantages derived from the incorporation of the Society in the year 1887, is the fact that it has now the right to hold its own funds in its own name. It was felt by the Council therefore that in place of appointing fresh trustees to join with the survivor in holding its funds, it would be well to have the property in question transferred to the Society's own name. This transaction has been carried out. In announcing this change the Council take the opportunity of expressing their thanks to Sir John Lubbock, Bart., M.P., the surviving trustee, and to Mr. Richard B. Martin, M.P., the Honorary Treasurer of the Society, for their valuable services in their respective positions, and of recording their hope that these gentlemen may long continue their active co-operation with the Society.

Following the practice observed on previous occasions, the Council have appointed a Committee, under the Presidency of Sir Robert Giffen, K.C.B., to make suggestions regarding the approaching census of 1901. A preliminary report from this Committee has been received, and, following out the recommendations therein contained, a letter offering certain suggestions, especially with regard to the making of an enumeration of the people, at least by sex and age, in the year 1906, has been addressed to the President of the Local Government Board, to the Secretary of State for Scotland, and to the Chief Secretary to the Lord Lieutenant of Ireland. The Committee is continuing its deliberations, and will in due course present a further report to the Council.

In accordance with the regulations under which the Guy Medal was instituted, the Council have awarded a medal in silver to Mr. Charles S. Loch, B.A., for his Paper on " Poor Relief in " Scotland : its Statistics and Development, 1791—1891," read before the Society at its meeting on the 19th April, 1898.

Subject to the usual conditions, the Howard Medal for 1898-99 (together with 20*l*.) will be awarded for an essay on the subject of " The Sentences on, and Punishments of, Juvenile Offenders in " the chief European Countries and the United States."
The following subject for 1899-1900 has been selected :—

" The Results of State, Municipal, and Organized Private " Action on the Housing of the Working Classes in

" London and in other Large Cities of the United
" Kingdom."

The experiment has been made during the session of holding
some of the ordinary meetings in the Society's own rooms. The
success which attended this innovation has been sufficient to
justify the hope that during the forthcoming session it will be
possible to make arrangements for reading most of the Papers of
the year in the council room, so that in the future it may be the
exception for the Society to assemble for the reading and discus-
sion of Papers elsewhere than in its own home.

The average attendance of Fellows at the ordinary meetings
during the past session has been slightly better than that of the
previous year, and, as they find that that hour is most convenient
to the general body of Fellows, it is the intention of the Council to
continue holding these meetings at 5 p.m.

An alteration introduced into the mode of printing the list of
Fellows has been effected; so that in the future an indication
may be afforded as to the services which Fellows have performed
for the Society in the direction of reading Papers before it, of
presenting books to its Library, or of acting upon its Council.

It may be well to notice here that, as it cannot be indicated
with certainty when the sessional cards are circulated at the com-
mencement of the Society's year, what Papers will be read upon
given dates, there is now furnished in the front pages of the
Journal, commencing with the issue for March, 1899, a list of the
arrangements made with regard to Papers up to the time of going
to press.

The Council note, with pleasure, that the number of new
Fellows elected during the session just closed shows some improve-
ment over that of 1897-98. The slight net decrease which appears
in the total is attributable to the fact that the list has been cleared
of an unusual number of names of Fellows who had allowed their
connection with the Society to lapse. They would urge upon the
Fellows of the Society the importance of their individual efforts
in obtaining fresh members.

The Council recommend to the Annual General Meeting an
alteration in the Bye-laws of the Society, by the addition of the
following paragraph to Bye-law No. 8 :—

" *Every person elected to the Society shall pay his first subscription*
" *(or, if he desire to become a Life Fellow, his composition) within*
" *three months at the latest of the date of his election, if he be resident*
" *in the United Kingdom. If he be resident abroad, this period*

" *shall be six months. If payment be not made within the time*
" *specified above, the election shall be void.*"

The Council have also made the following alterations in the regulations of the Library, with the view of more clearly expressing their intention.

The following paragraph has been added to Regulation 3 :—

" *On the termination of the year for which a subscription has not*
" *been paid, a Fellow whose payment is in arrear shall cease to have*
" *the privilege of using the library or of borrowing books therefrom.*"

Rule 6 now reads as follows :—

" *Any Fellow who damages or loses a book shall either replace the*
" *work or pay a fine equivalent to its value.*"

The cordial thanks of the Council have been tendered on behalf of the Society to the Auditors for their honorary services in auditing the Treasurer's accounts for the past year.

The following list of Fellows proposed as President, Council, and Officers of the Society for the Session 1899-1900, was submitted for the consideration of the meeting :—

COUNCIL AND OFFICERS FOR 1899-1900.

PRESIDENT.
THE RIGHT HON. SIR HENRY H. FOWLER, G.C.S.I., M.P.

COUNCIL

*William M. Acworth, M.A.
Arthur H. Bailey, F.I.A.
Jervoise A. Baines, C.S.I.
*Horace G. Bowen.
Arthur Lyon Bowley, M.A.
Sir Courtenay Boyle, K.C.B.
Edward W. Brabrook, C.B., F.S.A.
Sir Henry Charles Burdett, K.C.B.
Nathaniel Louis Cohen.
Major Patrick George Craigie.
Richard Frederick Crawford.
The Right Hon. the Earl of Dudley.
*Prof. F. Y. Edgeworth, M.A., D.C.L.
John Glover, J.P.
Frederick Hendriks, F.I.A.

Noel A. Humphreys.
Frederick Halsey Janson, F.L.S.
John Scott Keltie, LL.D., F.R.G.S.
*Charles S. Loch, B.A.
John Macdonell, C.B., LL.D.
Richard Biddulph Martin, M.A., M.P.
Rev. Wm. Douglas Morrison, LL.D.
*Sir Robert G. C. Mowbray, Bart.
Francis G. P. Neison, F.I.A.
Sir Francis S. Powell, Bart., M.P.
*Richard Price-Williams, M.Inst.C.E.
Lesley Charles Probyn.
R. Henry Rew.
H. Llewellyn Smith, M.A., B.Sc.
George Udny Yule.

Those marked * are new Members of Council.

TREASURER.
Richard Biddulph Martin, M.A., M.P.

HONORARY SECRETARIES.
Major P. G. Craigie. | Noel A. Humphreys.
Jervoise A. Baines, C.S.I.

HONORARY FOREIGN SECRETARY.
Major P. G. Craigie.

The abstract of receipts and payments, and the balance sheet of assets and liabilities on 31st December, 1898, are subjoined, together with the report of the Auditors on the accounts for the year 1898:—

(I.)—ABSTRACT *of* RECEIPTS *and* PAYMENTS *for the* YEAR *ending* 31*st* DECEMBER, 1898.

RECEIPTS.	£	s.	d.		PAYMENTS.	£	s.	d.
Balance in Bank, 31st December, 1897 ... £220 8 6					Rent less Tax .... £351 5 –			
					Less sublet ...... 62 10 –			
Balance of Petty Cash. 20 5 10						288	15	–
,, Postage Account 4 7 9					Rates and Taxes	50	9	6
	245	2	1		Fire, Lights, and Water	39	12	8
Dividends on 2,900*l.* Consols and 400*l.* G.N.R. Stock	84	16	8		Furniture and Repairs	25	5	4
Annual Subscriptions:—					Salaries, Wages, and Pension ...	499	19	4
34 Arrears .... £71 8 –					Journal, Printing...... £565 4 4			
639 for the year 1898 .... 1,341 18 –					,, Shorthand Reporting 27 13 8			
18 in Advance ...... 37 16 –					,, Literary Services 15 19 3			
—						608	17	3
691 1,451	1,451	2	–		Ordinary Meeting Expenses	51	4	8
					Advertising	35	9	–
Compositions	115	–	–		Postage and delivery of Journals..	74	16	4
Journal Sales	181	17	4		Stationery and Sundry Printing...	44	14	5
Advertisements in Journal	4	14	6		Library....................................	55	7	1
Mr. James Hey- wood's Legacy ... £500 – –					Incidental Expenses	50	6	–
Deduct cost of 400*l.* G.N.R. Stock 484 11 6						1,824	16	7
					Balance per Bank Book £244 12 11			
Balance of Legacy left by Mr. James Heywood	15	8	6		Balance of Petty Cash 24 3 3			
					,, Postage Account 4 8 4			
						273	4	6
Total............... £2,098	2,098	1	1		Total £2,098	2,098	1	1

(Signed) "CHAS. ATKINSON,

"A. H. BAILEY,

"2*nd February*, 1899. "THOMAS A. WELTON, F.C.A.,

} Auditors."

(II.)—BALANCE SHEET *of* ASSETS *and* LIABILITIES *on* 31st DECEMBER, 1898.

LIABILITIES.			ASSETS.	
	£ s. d.	£ s. d.		£ s. d.
Harrison and Sons, for Journal	142 14 10		Cash Balances	273 4 6
Miscellaneous, as per list	136 13 11		2,900*l.* New 2¾ per cent. Consols cost	2,760 14 5
		279 8 9		
18 Subscriptions received in advance		37 16 –	400*l.* G.N.R. Preferred Converted Ordinary Stock... cost	484 11 6
		317 4 9		
Balance in favour of the Society ...		3,310 14 8	Arrears of Subscriptions recoverable	50 – –
(Exclusive of (1) the Reversionary Interest bequeathed to the Society by the late Dr. Guy; (2) Books in the Library; (3) Journals, &c., in Stock; and (4) Pictures, Furniture, and Fixtures.)			Sundry debtors	59 9 –
		£3,627 19 5		£3,627 19 5

(Signed)   " CHAS. ATKINSON,

" A. H. BAILEY,   } *Auditors.*"

" *2nd February,* 1899.   " THOMAS A. WELTON, F.C.A.,

(III.)—BUILDING FUND (ESTABLISHED 10*th July,* 1873), BALANCE SHEET, *on* 31st DECEMBER, 1898.

LIABILITIES.			ASSETS.		
	£ s. d.	£ s. d.		£ s. d.	£ s. d.
			Invested as per last Account in Metropolitan Consolidated 3½ per Cent. Stock, in name of the Treasurer, Richard B. Martin, Esq., M.P...	Stock.	Cost.
Amount of Fund invested from last Account	267 9 8			251 15 3	267 9 8
Balance from 1895, 1896, and 1897 to be invested............	23 5 1		Balance from 1895, 1896, and 1897 to be invested	23 5 1	
		290 14 9	Balance from 1898 to be invested	8 10 4	
Dividends received during 1898		8 10 4			31 15 5
		£299 5 1			£299 5 1

(Signed)   " CHAS. ATKINSON,

" A. H. BAILEY,   } *Auditors.*"

" *2nd February,* 1899.   " THOMAS A. WELTON, F.C.A.,

" Report of the Auditors for 1898.

" *The Auditors appointed to examine the Treasurer's Accounts of the Society for the Year* 1898,

" Report :—

" *That they have compared the Entries in the Books with the several Vouchers for the same, from the* 1st *January to the* 31st *December,* 1898, *and find them correct, showing the Receipts (including a Balance of* 245*l.* 2*s.* 1*d., from* 1897) *to have been* 2,098*l.* 1*s.* 1*d., and the Payments* 1,824*l.* 16*s.* 7*d., leaving a Balance in favour of the Society of* 273*l.* 4*s.* 6*d. at the* 31st *December,* 1898.

" *They have also had laid before them an Estimate of the Assets and Liabilities of the Society at the same date, the former amounting to* 3,627*l.* 19*s.* 5*d., and the latter to* 317*l.* 4*s.* 9*d., leaving a Balance in favour of the Society of* 3,310*l.* 14*s.* 8*d., exclusive of* (1) *The Reversionary Interest bequeathed to the Society by the late Dr. Guy.* (2) *Books in the Library.* (3) *Journals, &c., in Stock, and* (4) *Pictures, Furniture, and Fixtures.*

" *The amount standing to the credit of the Building Fund at the end of the year* 1898 *was* 299*l.* 5*s.* 1*d., of which* 267*l.* 9*s.* 8*d. was invested in* 251*l.* 15*s.* 3*d. Metropolitan Three and a Half per Cent. Stock, in the name of the Treasurer, Richard B. Martin, Esq., M.P., thus leaving a balance of* 31*l.* 15*s.* 5*d. to be invested.*

" *They have verified the Investments of the Society's General Funds and the Building Fund, and also the Banker's Balance, all of which were found correct.*

" *They further find that at the end of the year* 1897 *the number of Fellows on the list was* 892, *which number was diminished in the course of the year to the extent of* 57, *by Death, Resignation, or Default, and that* 43 *new Fellows were elected, leaving on the list on the* 31st *December,* 1898, 878 *Fellows of the Society.*

(Signed) " Chas. Atkinson,
  " A. H. Bailey, } *Auditors.*"
  " Thomas A. Welton, F.C.A.,

2nd February, 1899.

PROCEEDINGS *of the* SIXTY-FIFTH ANNUAL GENERAL MEETING.

A. E. BATEMAN, Esq., C.M.G., Honorary Vice-President,
in the Chair.

THE circular convening the meeting was read.

The minutes of the last ordinary meeting having been read and confirmed,

The CHAIRMAN said the Report of the Council for the past year had been circulated, and so need not be read. The chief features in the report might however be briefly noticed. Though the Society had not yet quite recovered its former position, its condition was steadily improving. The meetings had been well attended, and the papers read at them had been full of interest. At the commencement of the report there was shown the present number of Fellows, and also how that number compared with those of other periods. The financial condition of the Society was fairly satisfactory, especially having regard to the fact that they had not as many Fellows now as they had had ten years ago. They were beginning to get some receipts from advertisements in the *Journal;* and in other ways the financial aspect of the Society was certainly better. A new contract had been entered into with their printers, and this would effect a substantial economy.

Following the usual practice, a Committee, under the presidency of Sir Robert Giffen, had been appointed to make suggestions with regard to the approaching census of 1901. A preliminary report from this Committee had already been received, and in accordance with its recommendations a letter, offering certain suggestions— partly on the old lines, viz., that they should have a quinquennial census at least as regards age and sex—had been addressed to the authorities responsible for the taking of the census throughout the kingdom.

A silver medal had been awarded to Mr. C. S. Loch, an old member of the Society, and one who had done uncommonly good work for it, for his paper on "Poor Relief in Scotland." With regard to the attendance of the Fellows at the meetings, the report mentioned that the experience of holding meetings occasionally in the Society's own rooms had been successful, and accordingly it was proposed that most of their meetings should be held there in the future. At the end of the report it was remarked that there appeared some improvement in the numbers of new Fellows elected, and it was explained that the slight net decrease which was apparent in the total on the books, was attributable to the fact that the list had been cleared of an unusual number of Fellows who had allowed their connection with the Society to lapse. Before

closing his remarks, the Chairman dwelt on the importance of the efforts of individual Fellows to obtain fresh members. Such efforts were far better than any circularising that could be done. If every Fellow would try to get one new member every year, or at least one every other year, the Society would be enabled to greatly extend its sphere of usefulness.

In conclusion, he moved " That the Report of the Council, the Abstract of Receipts and Payments, the Balance Sheet of Assets and Liabilities, and the Report of the Auditors for 1898, be adopted, entered on the Minutes, and printed in the *Journal*."

Mr. A. H. BAILEY seconded the motion, which was carried unanimously.

Mr. JESSE ARGYLE and Mr. A. W. W. KING having been appointed Scrutineers of the ballot for the election of the Council and Officers for the ensuing session,

The CHAIRMAN announced, whilst the ballot was being taken, that under Rule 9 the names of eight Fellows had to be removed from the list in default of payment of their subscriptions.

The CHAIRMAN then moved, in accordance with the notice as given in the annual report and in the circular convening the meeting—
" That the following paragraph be added at the end of Bye-law 8 :—

" Every person elected to the Society shall pay his first subscription (or, if he desire to become a Life Fellow, his composition) within three months at the latest of the date of his election, if he be resident in the United Kingdom. If he be resident abroad, this period shall be six months. If payment be not made within the time specified above, the election shall be void."

Major P. G. CRAIGIE seconded the motion, and it was carried unanimously.

The CHAIRMAN announced that the subject for the next competition for the Howard Medal would be " The Results of State, Municipal, and Organised Private Action on the Housing of the Working Classes in London and in other Large Cities of the United Kingdom." The essays would have to be sent in before the 30th June, 1900.

It was then announced that the proposed list of Council and Officers for the ensuing session had been unanimously adopted; and thanks were voted to the Scrutineers for their services. In making this announcement, the CHAIRMAN remarked that he considered it very important for the Society to have Sir Henry Fowler as President, as they all knew Sir Henry was a real statistician.

In their Society they had no politics, but they did notice that when Sir Henry Fowler made a speech on any subject he usually treated it statistically, and the statistics that he brought forward were generally full, fair, and accurate. He considered that it was very greatly to the advantage of the Society to obtain such a distinguished President to follow Mr. Courtney, who had served them so well during the two years of his presidency.

The CHAIRMAN then announced that he had now a very pleasant duty to perform, viz., to present the silver Guy Medal to Mr. C. S. Loch for his paper on " Poor Relief in Scotland." He added that though the medal was presented to Mr. Loch for the work he had put into this one paper, they all recognised the fact that Mr. Loch had been of great service to the Society in many other ways.

Mr. LOCH, in receiving the gift, expressed his appreciation of the honour which the Society had done him in making the presentation.

Mr. THOMAS HUDSON said he was probably one of the oldest Fellows present, having joined the Society in the year 1864. Three years ago he had asked why the time of the meetings had been altered from 7.45 to 5 o'clock. To this question the late Mr. J. B. Martin had replied that the alteration had taken place to suit the convenience of the majority of the Fellows, adding that, as a consequence of the change, an increase in the attendance at the meetings had been observed. No doubt the change was acceptable to those who attended. But how about those who could not come ? He had now been for three years without one opportunity of attending the meetings, from the fact that he was nearly always engaged at 5 o'clock, and no doubt other gentlemen were similarly situated. He was rather struck by the statement in the Report that the attendance had diminished to such an extent that the meetings could now be held in that comparatively small room. He went on to say that he should be especially glad if an exception could be made on the occasion when the President's Annual Address was delivered, so that the Chair on that occasion could be taken at the former time. He threw out the suggestion merely for the consideration of the Council, and did not wish to press it unduly.

The CHAIRMAN thanked Mr. Hudson for having raised this question, and assured him that the Council would give it their earnest consideration. But he explained that the speaker was mistaken in assuming that the attendance at Ordinary Meetings had diminished; on the contrary, it had been slightly improved. The hour of meeting must be arranged to suit the convenience of the great body of the Fellows, as it was impossible to suit that of all. The Council would feel the pulse of the Society, and do that which was best for the general interest.

Mr. JESSE ARGYLE asked a question as to the expense attaching to the holding of meetings at the Royal United Service Institution, and expressed his feeling that the Council Room was of a very suitable size for ordinary meetings.

In reply to his remarks, Major CRAIGIE said that on the last occasion of the reading of a paper in their own rooms they had an excellent attendance, and certainly the best discussion they had had for some time. Thus they were encouraged to continue meeting in that room, except possibly on occasions when they might anticipate an unusually large attendance.

Mr. THOMAS HUDSON proposed a cordial vote of thanks to the retiring President, Council, and Officers for their services during the past session, and to Mr. Bateman for so ably presiding on the present occasion.

Mr. LEVEAUX seconded the motion, which was carried unanimously.

The CHAIRMAN, on behalf of the Council and Officers, thanked the Fellows very heartily for the resolutions which had been passed in such kind terms. He expressed his regret that Mr. Courtney was not present to receive personally their thanks for coming forward as he did to take the presidency of the Society and for attending so well to his duties. He had done much that was of great advantage to the Society. Besides the President, the Society was very much indebted to the Honorary Secretaries, Major Craigie, Mr. Humphreys, and Mr. Baines, for the extremely able way in which they had performed their duties. He would also say that, besides the Honorary Secretaries, the Society depended a good deal upon the Assistant Secretary. On behalf of the Council, he would say that they were entirely satisfied with the way in which the duties of the Assistant Secretaryship were performed by Dr. Ginsburg.

On LIFE-TABLES—*their* CONSTRUCTION *and* PRACTICAL APPLICATION.
By T. E. HAYWARD, M.B. (Lond.), F.R.C.S. (Eng.), *Medical
Officer of Health for Haydock, Lancashire.*

AMONG the matters of widely varying interest as affecting the welfare of mankind, which from time to time are brought before the notice of this Society, those connected with the subject of Vital Statistics may justly be considered as second in importance to none.

It will also, probably, be admitted without contention, that one of the most important parts of the science of Vital Statistics is that which forms the subject of this paper; for a Life-Table may be defined as a scientific instrument designed for accurately measuring the forces of life and death prevailing, whether among a whole nation or in a small town, a mere unit in the great whole, and only by the use of Life-Tables can there be made exact comparisons between nations or between the separate communities which constitute nations, as regards their vitality.

To the Fellows of this Society it is a truism almost too obvious to suggest, that for obtaining accurate results correct methods must be employed, and that for obtaining strictly comparable results similar methods should be used.

Now, the Life-Tables which have hitherto been constructed have not all been worked out by exactly the same methods, and therefore, although the discrepancies may be comparatively small, the fact remains that comparison between them is to some extent invalidated by this consideration.

The hope may be expressed that in this paper some little contribution may be made to the ultimate devising of an " ideal " method of constructing Life-Tables, so that hereafter a similar plan having been followed in each case, the results obtained may be in the fullest possible degree comparable.

But few of the Fellows of the Society immediately addressed, except those connected with the departments of public health or official statistical work, are ever likely to actually engage in the work of practically attempting the construction of a Life-Table.

There are of course distinguished Fellows of this Society

who are engaged in the actuarial profession, but I should scarcely like to consider myself as venturing to address these.

Through the medium of the Royal Statistical Society I would desire to address myself chiefly to the body of Medical Officers of Health generally, believing that many of my colleagues will be ready to undertake the work of constructing local Life-Tables for their respective districts if they are aided in overcoming the initial difficulties associated with the task.

The attempt to follow such masters of the science of Vital Statistics as the late Dr. William Farr and Mr. Noel A. Humphreys, happily still surviving, who have, with such consummate ability on past occasions, presented papers to this Society on the same subject, may well give rise to hesitation and diffidence.

I should certainly never have presumed to make such an attempt had I not been honoured by a special request made by Mr. Noel A. Humphreys—such a request has acted as a stimulus to the undertaking of work additional to what had been already done, which would otherwise never have been contemplated.

Acknowledgment should also be made, at the very outset, of the great obligation which I am under to Mr. A. C. Waters, of the General Register Office, whom I must honour as my teacher in this subject, who has freely placed at my disposal his great experience in Life-Table construction, and without whose aid I should never have acquired the foundation of preliminary knowledge upon which the work to be embodied in this paper has been built up.

The plan which I propose to adopt is as follows:—

(1.) First of all to dogmatically describe the particular mode of constructing an extended Life-Table which I have arrived at, partly as the result of much laborious experimental work, and which I recommend for adoption, going very fully into details, so as if possible to anticipate and obviate for others the difficulties which I have met with, and the pitfalls into which I have stumbled. I cannot pretend to possess anything more than a very little knowledge of pure mathematics, and shall make no attempt to go more than slightly into explanation of the underlying reasons for the methods to be used. Those addressed are supposed to have merely a working knowledge of the use of seven-figure logarithms, and some patience in applying the ordinary rules of arithmetic.

(2.) Next, to describe a modification of the " short " method of constructing local Life-Tables first devised by the late Dr. William Farr, and described by him twenty-four years ago in the supplement to the Thirty-fifth Annual Report of the Registrar-General, and to demonstrate, if possible, that by the use of this modified short method a Life-Table for quinquennial age-intervals

can be constructed, giving such close approximations to the results to be worked out by the previously described "extended" method, as to make it scarcely necessary for merely local Life-Tables to undertake the more elaborate and laborious method.

(3.) Afterwards to give an account of the experimental work which has led up to the special methods of calculation recommended.

(4.) And lastly, to give an outline of the practical uses of a Life-Table when constructed.

Section I.

The problem of constructing an "extended" Life-Table, that is, one for every single year of life, resolves itself chiefly into calculating the series of fractions which are tabulated in a Life-Table under the heading of the p_x column. These fractions represent the chances (or probabilities) of surviving from one year to the next. Thus, p_x stands for the chance of surviving from the exact age x to the age $x + 1$.

By far the greatest and most difficult part of the labour involved in working out a Life-Table is taken up in working out these p_x values. They are the skeleton or supporting framework on which the whole structure is built up. When once they are obtained, the after labour, although considerable, is a mere matter of easy routine calculation.

Without going at all into the mathematical theory of probability, the following considerations will be obvious :—

(1.) If we know that on 1st January, 1898, a thousand infants have been born, and that by the time new year's day of 1899 dawns, 200 of these have died, then it is clear that the chance of any individual of the original number of infants surviving to the beginning of the second year of life is 800 out of 1,000, or $\frac{800}{1,000} = 0.8$, and so, generally, if we know the number of the living at any *exact* age x, indicated by "P_x," and the number of those dying during the following year, indicated by "d_x," then

$$p_x = \frac{P_x - d_x}{P_x} = \frac{\text{number living at end of year}}{\text{number living at beginning of year}}.$$

(2.) In actual practice, however, this simple mode of calculation (except for the first five years of life, as will afterwards be explained) cannot be adopted. The population numbers, as enumerated at each census, and the numbers returned in the death registers, do not give us the numbers of persons *at the beginning* of the several years or age-periods, but the numbers *at all ages* between certain fixed points.

Thus if, according to the census enumeration, 1,000 children are returned as living at age 4—5, this means that they are of any age between the beginning and the end of the fifth year of life. Now if twenty of these children are returned in the death register as dying at age 4—5, the problem of calculating the chance of survival becomes more complicated than the simple case just alluded to. In order to solve it we may assume two things :

(*a*.) That at the middle of the calendar year the average age of these children is $4\frac{1}{2}$ years.

(*b*.) That the number of deaths is evenly distributed during the year, half occurring in the first half of the year, and half in the second half of the year.

Therefore, on these two assumptions, which when large numbers are dealt with may be considered as approximately true for any year of life, *except the first*, the number of survivors at the beginning of the year would be $1,000 + 10$, and at the end of the year $1,000 - 10$, and the chance of surviving to the beginning of the sixth year of life would be expressed by the fraction $\frac{1,000 - 10}{1,000 + 10} = \frac{9\ 90}{1,010} = 0.98019$, and if we wished to calculate how many out of 100,000 at age 4 would survive to age 5, it would be done by multiplying 100,000 by 0.98019, the result being 98019.

To put the thing in a general formula, if "P_x" be the number returned at the census as living between any age x and the next age $x + 1$, they must be considered to be at the middle of the calendar year of the average age $x + \frac{1}{2}$, and if "d_x" be the number of deaths for the year at age x to $x + 1$, then the chance of surviving from age x to age $x + 1$ is expressed by the fraction $\frac{P_x - \frac{1}{2}d_x}{P^x + \frac{1}{2}d_x} = \frac{\text{number living at end of year}}{\text{number living at beginning of year}}$.

In the above example we have worked *directly* from the population and deaths. The rate of mortality per unit of the population or, as it is otherwise termed, the "central death-rate," which is expressed by the symbol "m_x" $= \frac{d_x}{P_x}$, and $\frac{1 - \frac{1}{2}m_x}{1 + \frac{1}{2}m^x}$ is only another way of expressing $\frac{P_x - \frac{1}{2}d_x}{P_x + \frac{1}{2}d_x}$.

There is no real need, therefore, as has usually been hitherto done, for working out the "m_x" values.

Data required.

Before the construction of a Life-Table can be proceeded with, the following data, or crude materials, are necessary :—

(1.) The total population numbers as enumerated at two succes-

sive censuses, say 1881 and 1891, and also the numbers classified into certain age-groups for each sex.

The age-groups referred to are :—

0— 5	15—25	45—55	75—85
5—10	25—35	55—65	85 and upwards
10—15	35—45	65—75	

In certain cases, as in those districts which contain public institutions, such as hospitals or lunatic asylums, the census numbers may need correction.

(2.) The numbers of deaths registered in the district during the ten calendar years most nearly corresponding to the census interval, as 1881-90, also arranged in similar age- and sex-groups.

The age-group 0—5, however, requires to be still further sub-divided into the following groups.

$$0—1 \begin{cases} \text{under 3 months} \\ \text{3 months and under 6 months} \\ \text{6} \qquad ,, \qquad \text{1 year} \end{cases}$$

1—2
2—3
3—4
4—5

It is of very special importance to secure the greatest possible accuracy in correcting the numbers of deaths, by *excluding* all such deaths as do not properly belong to the district, and also by *including* the deaths of persons properly belonging to the district which have occurred outside it, such as deaths in workhouses, &c. However, until something corresponding to an official "clearing house" is established for ensuring that all deaths are referred to their proper districts, insuperable difficulties will often be met with in securing absolute accuracy.

It must be borne in mind that an error of *one* in the death numbers will have a many times greater effect in vitiating results than an error of *ten* in the population.

(3.) It is also requisite to have returns of some of the deaths for some years preceding the decennium being dealt with, as follows :—

At age 0—1 for the years 1877-80 inclusive
,,   1—2   ,,   '78-80   ,,
,,   2—3   ,,   '79-80   ,,
,,   3—4 for the year   1880

(4.) The numbers of male and female births in each of the years 1876-90 inclusive are also required.

To find the True Mean Total Population.

The very obvious and simple method of taking the arithmetical mean of the two census numbers is unfortunately not accurate enough, for two reasons—

(*a.*) On the assumption that population increases or decreases by a constant "rate," that is, in geometrical progression, the true mean must necessarily be *less* than the arithmetical mean.

(*b.*) The interval between two censuses is later both at its beginning and its ending by a quarter of a year than the ten calendar years most nearly corresponding.

(For a complete exposition of these points, the Supplement to the Fifty-fifth Annual Report of the Registrar-General, pp. xlii and xliii, may be consulted.)

If the population of a district have been enumerated at a certain number denoted by " P " at the census of 1881, and at an increased number denoted by " P' " at the census of 1891, then the rate of increase per unit " r " (which is assumed to be constant)

$$= \frac{P'}{P}, \text{ or } P' = r P$$

and the true mean population for the ten calendar years 1881-90

$$= \frac{r P - P}{r^{\frac{1}{40}} \times \text{hyp. log. } r}.$$

There is no need however to undertake the labour of working from this formula ; for by reference to the last Decennial Report of the Registrar-General, already referred to, at pp. xliv and xlv there will be found a table called " P," which will greatly facilitate the work, and which is the result of an enormous amount of laborious calculation.

It is simply necessary to find the value of " r," and to deduce by means of this table the corresponding " factor of correction," and then to divide the arithmetical mean of the two census numbers by this factor. The result is the required true mean total population.

As it is very desirable that there shall be no error made in this most important initial calculation, it may be well to mention that there is another simple method of calculation which may be used.

If we have the population numbers for the *beginning* of 1881 and the *end* of 1890, then calling the arithmetical mean of these numbers " A," and their geometrical mean " G," a very near approximation to the true mean population for the ten calendar years 1881-90 is to be arrived at by adding together one-third of the arithmetical mean and two-thirds of the geometrical mean, or $\frac{A + 2G}{3}$ (very nearly) = true mean population.

It will be obvious that—

log. population at beginning of 1881 = log. census number 1881 − $\frac{1}{40}$ log. r, and

log. population at end of 1890 = log. census number 1891 − $\frac{1}{40}$ log. r.

To take an actual example—

Method I.

Population enumerated at census of 1881 = 111,343

,,   1891 = 131,463

then log. r = log. 131,463 − log. 111,343 = 5·1188036 − 5·0466629 = 0·0721407.

Therefore r = 1·180703.

Common log. of r = 0·0721407, and hyp. log. r = 0·1661101

rP − P = 131,463 − 111,343 = 20,120.

Therefore—

log. 20,120 − ($\frac{1}{40}$ log. 1·180703 + log. 0·1661101) = log. true mean population.

= 4·3036280 − (0·0018035 + $\bar{1}$·2203961) = 5·0814284.

Therefore true mean population = 120,622·5.

Method II.

" r " as above found = 1·180703.

By Table " P " in Registrar-General's Decennial Supplement, the " factor of correction " corresponding to this value of r

= 1·006438 + (·006483 − ·006438) × ·703 = 1·006438 + ·000032 = 1·006470

arithmetical mean of rP and P = $\frac{1}{2}$ (111,343 + 131,463) = 121,403.

Therefore log. 121403 — log. 1·006470 = log. true mean population

= 5·0842294 − 0·0028009 = 5·0814285

Therefore true mean population = 120,622·5.

Method III.

log. 111,343 − $\frac{1}{40}$ log. 1·180703 = log. population at *beginning* of 1881 ;

5·0466629 − 0·0018035 = 5·0448594.

Therefore population at beginning of 1881 = 110,881·6.

Similarly—

log. 131,463 − $\frac{1}{40}$ log. 1·180703 = log. population at *end* of 1890.

5·1188036 − 0·0018035 = 5·1170001.

Therefore population at end of 1890 = 130,918·1.

" A " = $\frac{1}{2}$ (110,881·6 + 130,918·1) = 120,899·9 ;

log. " G " = $\frac{1}{2}$ (5·0448594 + 5·1170001) = 5·0809298.

Therefore G = 120,484·1,

and $\frac{A + 2G}{3}$ = 120,622·7.

To find the True Mean Population Numbers for the several Age and Sex-Groups.

Having obtained the true mean total population, the next step is to divide this up between the separate age- and sex-groups.

The method to be adopted may be termed the " method of " mean proportions." It is based on the assumption that in the interval between two censuses the proportion of each group to the whole has changed uniformly, that is, supposing in some

particular age group the proportion is 10 per cent. at the first census and 20 per cent. at the second census, then the proportion at the *middle* of the ten years' interval would be 15 per cent. But seeing that the middle of the ten calendar years 1881-90 is only four and three-quarter years after the date of the earlier census, we should have to take $\frac{19}{20}$ of the change in five years, corresponding to $\frac{19}{40}$ of the change in ten years.

A convenient way of making the calculations is as follows :—

(*a.*) Calculate from the numbers enumerated at each of the two censuses the proportions per million in each group as existing at each census. (The sum of the numbers corresponding to all the male and female groups will of course be a million.)

(*b.*) For each age-group find the arithmetical mean of the proportionate numbers at the two censuses. This gives the mean proportion at the end of five years after the earlier census.

(*c.*) Take the difference between this mean proportion and the proportion existing at the earlier census ; this gives the change of proportion in five years.

(*d.*) If the change in proportion has been an *increasing* one, $\frac{1}{20}$ of the change in five years must be *subtracted* from the mean proportion, and if the change has been a *decreasing* one, it must be *added*.

(*e.*) Having thus found the proportion *per million* for each age- and sex-group, as existing four and three-quarter years after the earlier census, a series of simple sums in the "rule of three" will give the proportions as existing in the true mean *total* number already found.

The sum of the parts should of course exactly equal the whole, if the calculations have been correctly made.

The use of logarithms renders these calculations comparatively easy.

The method may be made clearer by a numerical example :—
At census 1881, out of total enumerated population of 111,343, number of males in age-group 0—5 = 7,468.

At census 1891, out of total enumerated population of 131,463, number of males in same age-group = 7,507.

(*a.*) To find the proportions per million at each census—

$$7,468 : 111,343 :: x : 1,000,000,$$
$$7,507 : 131,463 :: x' : 1,000,000.$$

log. x = log. 7,468 + log. 1,000,000 — log. 111,343
$$= 3\cdot8732043 + 6\cdot0000000 - 5\cdot0466629 = 4\cdot8265414.$$
Therefore $x = 67,072\cdot01.$

log. x' = log. 7,507 + log. 1,000,000 — log. 131,463
$$= 3\cdot8754664 + 6\cdot0000000 - 5\cdot1188036 = 4\cdot7566628.$$
Therefore $x' = 57,103\cdot51.$

(*b.*) Mean proportion per million, *i.e.*, the proportion assumed to be existing at the exact middle of the intercensal period

$$= \tfrac{1}{2}\,(57{,}103{\cdot}51 + 67{,}072{\cdot}01) = 62{,}087{\cdot}76.$$

(*c.*) Change of proportion in five years

$$= 62{,}087{\cdot}76 - 67{,}072{\cdot}01 = -\,4{,}984{\cdot}25.$$

(*d.*) Proportion existing at $4\tfrac{3}{4}$ years from census of 1881

$$= 62{,}087{\cdot}76 + \tfrac{1}{20}4{,}984{\cdot}25 = 62{,}336{\cdot}97.$$

(If the change of proportion had been an *increasing* one, the quantity $\tfrac{1}{20}4{,}984{\cdot}25$ would have had to be *subtracted*.)

(*e.*) To find the proportion of males in age-group 0—5, in the total true mean population of $120{,}622{\cdot}5$:—

$$62{,}336{\cdot}97 : 1{,}000{,}000 :: x : 120{,}622{\cdot}5.$$

$$\log.\ x = \log.\ 62{,}336{\cdot}97 + \log.\ 120{,}622{\cdot}5 - \log.\ 1{,}000{,}000$$
$$= 4{\cdot}7947457 + 5{\cdot}0814285 - 6{\cdot}0000000 = 3{\cdot}8761742.$$

Therefore $x = 7{,}519{\cdot}2.$

That is out of the total " years of life," or " lives at risk " for the ten years 1880-91, numbering 1,206,225, the proportion belonging to males, for the age-period 0—5, is 75,192.

The work of calculating the p_x values may now be proceeded with. A preliminary observation may be made that as the population and death numbers for ten years are being dealt with, either ten times the mean annual population numbers must be used (the " total lives at risk ") with all the deaths for ten years, or one-tenth of the deaths with the mean annual population numbers. The result will, in either case, of course be the same. Perhaps the *former* course is best to adopt.

Calculation of the p_x Values for the First Five Years of Life.

Although at the census enumerations the numbers are given of those living for each of the years from 0—1 to 4—5, these numbers are found to be *altogether unreliable*. There is so much misstatement of age that more are returned as surviving at some of the later ages than at preceding ages, and more than could possibly be surviving, as shown by a direct calculation from the births and deaths for the separate years, which is absurd. These census numbers, therefore, have to be discarded—we can only use them to determine *the total mean population for the age-period 0—5.*

Having this number for males and for females, as already calculated, to work from, the numbers living at the separate ages from 0—1 to 4—5, have to be determined by processes of calculation based on the numbers of births and of deaths under 5 years of age as previously set forth in the list of data required.

The following is an explanation of the method to be employed —males and females being of course dealt with separately :—

The deaths under 1 year of age in the ten years 1881-90 must necessarily occur out of the whole number born in the nine years 1881-89, and out of *part* of those born in the year 1880, and *part* of those born in the year 1890. The deaths under 1 year of age in the ten years 1881-90 may therefore be fairly taken as occurring out of ½ births in 1880 + all births in 1881-89 + ½ births in 1890.

In the same way the deaths under 1 year in the ten years 1880-89 may be taken as occurring out of ½ births in 1879 + all births in 1880-88 + ½ births in 1889; and subtracting these deaths from the total number of births out of which they occurred, will give the number of children aged 1 year out of whom the deaths occurred in 1881-90 of children between 1 and 2 years of age.

The following is the complete scheme for the calculation:—

(*a*.) For the number *at birth* in the ten years 1881-90, take

> ½ births in 1880 + all births in 1881-89 + ½ births in 1890.

(*b*.) For the number *at 1 year of age* in the ten years 1881-90, take

> ½ births in 1879 + all births in 1880-88 + ½ births in 1889,
> Less the deaths under 1 year in the ten years 1880-89.

(*c*.) For the number *at 2 years of age* in the ten years 1881-90, take

> ½ births in 1878 + all births in 1879-87 + ½ births in 1888,
> Less the deaths under 1 year in the ten years 1879-88,
> And   „   at age 1—2   „   '80-89.

(*d*.) For the number *at 3 years of age* in the ten years 1881-90, take

> ½ births in 1877 + all births in 1878-86 + ½ births in 1887,
> Less deaths under 1 year in 1878-87,
> And   „   at age 1—2   „   '79-88,
> „   „   „   2—3   „   '80-89.

(*e*.) For the number *at 4 years of age* in the ten years 1881-90, take

> ½ births in 1876 + all births in 1877-85 + ½ births in 1886,
> Less deaths under 1 year in 1877-86,
> And deaths at age 1—2   „   '78-87,
> „   „   2—3   „   '79-88,
> „   „   3—4   „   '88-89.

We shall thus obtain a series of five numbers, *a*, *b*, *c*, *d*, *e*— calling their sum "N," then $a + b + c + d + e = N$.

It must be very carefully noted, however, that these numbers give NOT the population numbers *at all ages*, from birth to age 1, from age 1 to age 2, &c., but the numbers *actually starting* at birth, at 1 year of age, at 2 years of age, &c.

Now the total number living at the age-period 0—5, which we have already calculated from the census enumerations (which we

may call "C"), represents the number living *at all ages* from birth to age 5, and corresponds to the total N *after half a year's mortality*, as well as *altered by migration.*

In order to make N and C comparable—

(1.) Either N must be *brought on* to the middle of the years by *subtracting* half the mortality for the several years.

(2.) Or C must be *carried back* half a year by restoring the numbers of those who have died in the first half of the years of life.

The latter method may be considered as best to adopt, as being the most direct, and as enabling us to calculate the p_x values by the more simple formula $\dfrac{P - d}{P}$.

At age 0—1 more than half the mortality occurs in the first half of the year of life. At each of the other ages it may fairly be assumed that the mortality is evenly distributed, that is, half in the first six months and half in the second six months of the years of age.

Therefore by adding to C the deaths under 6 months of age during the years 1881-90, and half the deaths during these years at ages 1—2, 2—3, 3—4, and 4—5, we shall obtain a corrected total, which may be called "T."

C + deaths under 6 months of age in 1881-90 +

$$\frac{\text{deaths at ages } 1\text{—}2,\ 2\text{—}3,\ 3\text{—}4,\ 4\text{—}5,\ \text{in } 1881\text{-}90}{2} = \text{T.}$$

The difference which still remains between T and N will represent chiefly the alteration due to migration. In order to eliminate this difference, the total T must be divided up in the same proportions as a, b, c, d, e bear to N. We shall thus finally obtain a series of five numbers, which may be called P_0, P_1, P_2, P_3, P_4.

$$\text{Thus } a : \text{N} :: P_0 : \text{T, \&c., \&c.}$$

Having among the data the number of deaths at age 0—1 during the ten years 1881-90, "d_0," and the corresponding numbers at ages 1—2, 2—3, 3—4, and 4—5, d_1, d_2, d_3, and d_4, the p_x values may now be readily found, thus:—

$$p_0 = \frac{P_0 - d_0}{P_0}$$

$$p_1 = \frac{P_1 - d_1}{P_1} \text{ \&c., \&c.}$$

This method of calculation is of course open to the objection that the alterations due to migration may not be exactly proportionate to the numbers living at each of the first five years of life, but, at least, it gives a nearer approximation to the truth than

the obviously erroneous numbers of the census enumerations.
Considerations of space have prevented me from seeking to make
these last described processes of calculation clearer (as I had
proposed to do) by showing the working out of actual examples.

Up to this point I had already worked out a Life-Table for my
own sanitary district from data which I had myself compiled. I
was proposing to continue using these data for the work necessary
for this paper. I found, however, that there were so many anomalies
and irregularities due to the smallness of the population dealt
with, that I have had to use some other figures. I have therefore
taken the liberty, for which I apologise to Dr. Tatham, of using
the data on which the Manchester City (males) Life-Table was
founded.

Calculation of the p_x Values for the Years of Life after the First Five.

The data available from this point are the numbers of popula-
tion and of deaths grouped according to age-periods.

It is obvious that a mean value of p_x for the age-period 5—10
may readily be arrived at from the population and death numbers
for this age-period, thus—

$$\frac{\text{Population} - \frac{1}{2}\text{ deaths}}{\text{Population} + \frac{1}{2}\text{ deaths}} = p_{5-10},$$

that is, the mean chance of living one year in the interval from
age 5 to age 10, is denoted by p_{5-10}.

Seeing that the mortality during this age-period is *decreasing*,
the p_x values would be increasing year by year, if we could get at
the *exact* facts, and the mean of the separate yearly values of p_x for
the age-period would be *greater* than the mean value deduced from
the total figures.

At some point during the age-period 10—15 the rate of
mortality reaches its *lowest* point, and therefore the p_x value
reaches its *highest* point.

The mean of the separate yearly values of p_x for this age-
period, assuming that we could get them by an exact knowledge
of the facts relating to each year, would probably not greatly
differ from the mean as deduced from the total numbers for this
age-period by the fraction $\frac{P - \frac{1}{2}d}{P + \frac{1}{2}d}$.

When we reach the age-period 15—25, the mortality has begun
to *increase*, and the yearly values of p_x therefore to decrease, and
the mean of the separate yearly values of p_x for this age-period
would be *less* than the mean value of p_x calculated by the fraction
$\frac{P - \frac{1}{2}d}{P + \frac{1}{2}d}$ for the whole age-period.

For the remaining age-periods, during which the mortality increases more and more, the differences of the true mean values of p_x from the means simply calculated from the total population and death numbers would become more and more marked in the direction of excess of the latter over the former.

In order therefore to obtain a series of p_x values approximating to those which we *infer* to exist, if we could get at the exact facts, an elaborate process of calculation must be adopted, known in mathematical terminology as "interpolation by the method of "finite differences."

We have to so divide up the total numbers of population and deaths for each age-period into subdivisions *belonging to each separate year*, that we shall obtain a smooth and symmetrical p_x curve, without any sudden jumps or breaks in its course.

It is by no means certain, however, that the *true* curve, if we could get it by an absolutely exact knowledge of the ages of the living and of the dying for each of the years of life, would be quite the same as that mathematically deduced, for there are certain ages or age-periods more "critical" to life than others.

However, we have the broad and general facts that the mortality decreases from birth up to some point between age 10 and age 15, and that after age 15 it increases, at first slowly, and afterwards more and more rapidly, and that the changes take place by smooth gradations from one year to another, and therefore the curve mathematically deduced does probably approach, to a sufficiently near degree, the hypothetical true curve.

It must also be clearly understood that by the process of interpolation to be presently described, *the foundation facts are not at all altered.*

The force of mortality at each age-period, equivalent to so many deaths out of so many living, is simply divided up and distributed, so as to make the series of p_x values of one age-period begin and end with appropriate relation to the preceding and following series.

The process of interpolation, as applied to any given age-period, is simply drawing a curve between two fixed points with relation to other fixed points on either side of the two being immediately dealt with.

Those who may desire to go thoroughly into the mathematical theory underlying methods of interpolation, cannot do better than consult "The Institute of Actuaries' Text Book," Part II, by Mr. George King, F.I.A., &c.

Up to this point (*i.e.*, as far as the calculation of p_4) the work of the Manchester City Life-Table was done exactly as has been here described.

In dealing with the data hereafter a different method will be adopted than that which was used in the construction of this Life-Table.

In the Manchester City Life-Table (males), the following data are given as part of the foundation numbers :—

At Age	Estimated Mean Population for the Ten Years 1881-90 (*i.e.,* Ten Times the Mean Annual Numbers).	Deaths in the Ten Years 1881-90.
4— 5......................	66,018*	1,129
5—10......................	314,343	2,396
10—15.......	290,034	1,075
15—25......................	522,994	3,227
25—35......................	444,524	4,901
35—45......................	333,934	6,528
45—55......................	220,426	6,865
55—65......................	124,294	6,762
65—75......................	52,964	5,437
75—85....	11,842	2,158
85 and upwards	827	254

* The number given in the table on p. 17 of the "Introduction to the "Manchester City Life-Tables" is 66,582 *at age* 4. From the explanations previously given in this paper, it will be obvious that the number at age 4—5 will be found by *subtracting half the deaths* at age 4—5, and 66,582 — $\frac{1}{2}$1,129 = 66,017·5.

From these columns the two others next following can be readily constructed by successive additions, beginning from below, representing (Population — $\frac{1}{2}$ deaths) and (Population + $\frac{1}{2}$ deaths) *at each age and upwards.*[1] These numbers must be then translated into their corresponding logarithms.

At each Age and upwards.	Population, — $\frac{1}{2}$ Deaths.	Population, + $\frac{1}{2}$ Deaths.	Corresponding Logs.	
			P — $\frac{1}{2}$ Deaths.	P + $\frac{1}{2}$ Deaths.
4	2,360,833·5	2,401,565·5	$u_4 = 6\cdot3730654$	6·3804945
5	2,295,380·5	2,334,983·5	$u_5 = 6\cdot3608547$	6·3682838
10	1,982,235·5	2,019,442·5	$u_{10} = 6\cdot2971553$	6·3052315
15	1,692,739·0	1,728,871·0	$u_{15} = 6\cdot2285900$	6·2377626
25	1,172,358·5	1,205,263·5	$u_{25} = 6\cdot0690604$	6·0810820
35	730,285·0	758,289·0	$u_{35} = 5\cdot8634924$	5·8798347
45	399,615·0	421,091·0	$u_{45} = 5\cdot6016418$	5·6243759
55	182,621·5	197,232·5	$u_{55} = 5\cdot2615519$	5·2949785
65	61,708·5	69,557·5	$u_{65} = 4\cdot7903451$	4·8423439
75	11,463·0	13,875·0	$u_{75} = 4\cdot0592983$	4·1422330
85	700·0	954·0	$u_{85} = 2\cdot8450980$	2·9795484

The symbol u_x, it must be noted, means *at age x and upwards.*

[1] It is more convenient, as avoiding fractions of death, to take $2P — d$ and $2P + d$.

The reasons for working with the logarithms of the numbers, and thus obtaining a *modified geometrical progression* in the interpolated quantities, instead of the *modified arithmetical progression* which would be obtained by working out the *numbers* themselves, are lucidly set forth in the "Introduction to the Manchester Life-"Tables." The chief advantage is that by the use of logarithms there is possible a *rational* continuation onwards of the series below the point at which the data terminate. These data terminate at age 85, for the recorded figures at age 95 and upwards are too unreliable to work with, and often lead to the irrational result of an *increasing* instead of a *decreasing* series of p_x values.

In working out interpolations in a series of logarithms they are dealt with as if they were numbers, and *afterwards* translated into common numbers. It is now obvious that if we can interpolate the logarithms corresponding to u_6 in both of these series, we shall, by translating them into the corresponding numbers, be easily able to calculate the value of p_5, for u_5 representing the number at age 5 and upwards, and u_6 the number at age 6 and upwards, then $u_5 - u_6$ will give the number from age 5 to age 6, and this being obtained for both the series $P - \frac{1}{2}d$ and $P + \frac{1}{2}d$, the numerator and denominator of the fraction $\dfrac{P - \frac{1}{2}d}{P + \frac{1}{2}d}$ are at once provided for the year 5—6.

Similarly, when u_7 is found, $u_6 - u_7$ will give the values for the year 6—7, and the means of calculating the value of p_6.

In most of the previously constructed extended Life-Tables these interpolations have only been made at certain points in the population and death numbers. Thus, u_6 having been found for population and for deaths, p_5 has been worked out; u_{16} having been found, p_{15} has been arrived at; and so having obtained a series of p_x values, p_5, p_{15}, p_{25}, &c., the p_x values for the intermediate years have been interpolated from *these*, and not *directly* from the population and deaths for each year. The chief reason for this has probably been that a smooth and symmetrical curve of p_x values has been obtainable with only three or four orders of differences; but it cannot be said that the series of p_x values thus obtained for any given age period, say p_{15} to p_{24}, represents the "force of mortality" corresponding to the total population and death numbers for the age period 15—25, in as exact a degree as if the p_x values for *each year* are worked out *directly* from interpolation in the population and death numbers. It is therefore best to adopt the latter method.

Of course the two u_x columns can be constructed by taking population and deaths *separately* instead of combining them, as in the above-given example.

More may be said on this point afterwards, but I think that the *combined* method is much to be preferred.

In order to get a good p_x curve from the population and deaths *directly*, it is necessary to take at least five orders of differences.

It would, of course, be *possible* to work out *one* scheme of ten orders of differences running through the series of eleven terms of u_x, from u_4 to u_{85} inclusive, but this would involve a very enormous amount of laborious calculation.

For five orders of differences the u_x terms have to be dealt with in series of six each.

The scheme which I have adopted, on the principle of the "survival of the fittest," is to be thus represented :—

1st Series.	2nd Series.	3rd Series.	4th Series.	5th Series.
u_4				
u_5	u_5			
u_{10}				
u_{15}————	u_{15}	u_{15}		
u_{25}	u_{25}————	u_{25}	u_{25}	
u_{35}	u_{35}————	u_{35}————	u_{35}	u_{35}
	u_{45}	u_{45}————	u_{45}	u_{45}
	u_{55}	u_{55}	u_{55}————	u_{55}
		u_{65}	u_{65}————	u_{65}
			u_{75}	u_{75}
				u_{85}

If the series were placed *end to end*, there would be breaks or irregular transitions in the symmetry of the curve obtained. These are to be avoided.

(*a.*) By only using the *central* part of each series. In the cases of the first and fifth series this principle cannot obviously be carried out.

(*b.*) By "welding" or combining the adjoining series by a method to be afterwards described. The positions at which the welding is to be effected are indicated by ==.

The values of u_6 to u_{14} are obtained from the 1st series, u_{16} to u_{24} by combining series 1 and 2, u_{26} to u_{34} by combining series 2 and 3, u_{36} to u_{44} by combining series 3 and 4, u_{46} to u_{54} from series 4 *alone*, u_{56} to u_{64} by combining series 4 and 5, u_{66} and onwards from series 5 alone.

The first series u_4, u_5, u_{10}, u_{15}, u_{25}, u_{35}, is the most difficult to deal with, as the intervals between the given terms are *unequal*.

The problem of interpolating a series of values with n orders of differences is to be solved—

(*a.*) By obtaining $n + 1$ consecutive terms of the series, or

(*b.*) By obtaining a line of the n differences.

The latter method requires less voluminous calculations than the former, *when once the requisite formulæ have been worked out.*

The former method will first be described for the series now being considered.

The description of the latter method, as applied to this series, will be more easily comprehended after it has been explained in relation to the more simple instance of Series 2.

We have given u_4 and u_5, and we need to work out u_6, u_7, u_8, and u_9 to have the required six consecutive terms.

To solve the problem, special formulæ have to be worked out from the general formula (or theorem) of Lagrange, by which, having given any $n + 1$ terms of a series with n orders of differences, or in other words, any $n + 1$ points in a curve of the nth degree, any other term in the series can be expressed in terms of the data, that is to say, any other point in the curve can be located with reference to the given fixed points.

I have worked out these formulæ as follows :—

$$u_6 = \frac{-1102u_4 + 3156{\cdot}5688u_5 + 420{\cdot}87584u_{10} - 95{\cdot}6536u_{15} + 7{\cdot}9112u_{25} - 0{\cdot}70224u_{35}}{2387}.$$

$$u_7 = \frac{-1344u_4 + 2887{\cdot}3152u_5 + 1026{\cdot}60096u_{10} - 196{\cdot}8624u_{15} + 15{\cdot}2768u_{25} - 1{\cdot}33056u_{35}}{2387}.$$

$$u_8 = \frac{-1071u_4 + 2045{\cdot}1816u_5 + 1636{\cdot}14528u_{10} - 239{\cdot}0472u_{15} + 17{\cdot}1864u_{25} - 1{\cdot}46608u_{35}}{2387}.$$

$$u_9 = \frac{-1664u_4 + 2978{\cdot}976u_5 + 6335{\cdot}1488u_{10} - 541{\cdot}632u_{15} + 35{\cdot}464u_{25} - 2{\cdot}9568u_{35}}{7161}.$$

The last of this series cannot be expressed with the denominator 2387, as 1664 is not divisible by 3. The correctness of these formulæ is to be checked by finding that the algebraical sum of all the coefficients $= 1$ in each case.

The somewhat appalling series of calculations in applying these formulæ to the logarithms of u_4, u_5, &c., must be undertaken by direct multiplication and division. The work is facilitated by first setting down and carefully checking all the multiples of each of the u_x values from 2 to 9 inclusive, and also the multiples of the denominators. Then it is simply a method of addition, subtraction and division.

It is requisite to work out the results to *at least* five extra places of decimals after the seven of the logs. I have usually worked with six extra places.

Having applied the formulæ to the u_x values in the $P + \frac{1}{2}d$ column, the following series are obtained :—

	δ^1.	δ^2.	δ^3.	δ^4.	δ^5.
$u_4 = 6{\cdot}3804945$	-122107	$-1217{\cdot}930265$	$-\ 73{\cdot}681560$	$-16{\cdot}846744$	$+1{\cdot}214391$
$u_5 = 6{\cdot}3682838$	$-123324{\cdot}930265$	$-1291{\cdot}611825$	$-\ 90{\cdot}528304$	$-15{\cdot}632353$	
$u_6 = 6{\cdot}3559513{:}069735$	$-124616{\cdot}542090$	$-1382{\cdot}140129$	$-106{\cdot}160657$		
$u_7 = 6{\cdot}3434896{:}527645$	$-125998{\cdot}682219$	$-1488{\cdot}300786$			
$u_8 = 6{\cdot}3308897{:}845426$	$-127486{\cdot}983005$				
$u_9 = 6{\cdot}3181410{:}862421$					

The marks : are conveniently used to denote the end of seven places of decimals, and avoid the necessity of putting down a good many cyphers.

To the right hand of the series of u_x values their successive differences are placed. The operation of "differencing" consists in changing the sign of the *upper* of the two quantities differenced. and then taking their algebraical sum, that is, their *sum* if the signs are *like*, and their *difference* if the signs are *unlike*.

The first series of differences is denoted by the symbol δ^1 or δ. The same operation is then repeated on the first order of differences, and thus the second order of differences is obtained, denoted by δ^2, and so on until the last difference δ^5 is obtained.

Now it is obvious that if the calculations have been correctly performed, these differences can be carried down through the whole series of u_x values as far as u_{35}, and at each of the positions u_{10}, u_{15}, u_{25}, u_{35}, the values worked out should exactly coincide with the data worked from, at least as far as the seven decimal places of the logs., or in other words, the curve must pass exactly through the given fixed points.

In carrying the interpolating process *downwards* the differences must be successively *added ;* in carrying it upwards the differences would have to be *subtracted ;* that is, their signs must be changed and the sum or difference of the two quantities taken according as the signs are then like or unlike.

In the series now being dealt with the proof of correctness is very quickly reached, as the next term in the series is u_{10}.

The operation is thus proceeded with, it being more convenient to work from left to right.

$\delta^5 + \delta^4$.	$\delta^4 + \delta^3$.	$\delta^3 + \delta^2$.	$\delta^2 + \delta$.	$u_x + \delta$.
−15:632353	−106:160657	−1488:300786	−127486:983005	6·3181410:862421 = u_9
+ 1:214391	− 14:417962	− 120:578619	− 1608:879405	− 129095:862410
−14:417962	−120:578619	−1608:879405	−129095:862410	6·3052315:000011 = u_{10}
+ 1:214391	− 13:203571	− 133:782190	− 1742:661595	− 130838:524005
−13:293571	−133:782190	−1742:661595	−130838:524005	6·2921476:476006 = u_{11}
	Carrying these differences downwards, the following		$\big\{$	6·2377626:001147 = u_{15}
	results are successively arrived at		$\big\{$	6·0810820:049109 = u_{25}

Usually with six extra places of decimals, the u_{10} value should only differ in the last place of decimals. If an error should be found in the third or fourth place of extra decimals at u_{10}, the work must be revised, as the cumulative effect of small errors is enormous.

Having effected the interpolation as far as u_{15} in each of the

series $P - \frac{1}{2}d$ and $P + \frac{1}{2}d$, the resulting logs. are to be translated into their corresponding numbers and differenced. Thus —

P − ½d.				P + ½d.		
	Year.	$u_x - u_{x+1}$.			Year	$u_x - u_{x+1}$.	
$u_5 = 2{,}295{,}380\cdot5$	5 —	64,555·9 ⎫	⎫	$u_5 = 2{,}334{,}983\cdot5$	5 —	65,373·0 ⎫	⎫
$u_6 = 2{,}230{,}824\cdot6$	6 —	63,611·6		$u_6 = 2{,}269{,}610\cdot5$	6 —	64,199·0	
$u_7 = 2{,}167{,}213\cdot0$	7 —	62,639·1	$u_5 - u_{15}$	$u_7 = 2{,}205{,}411\cdot5$	7 —	63,064·6	$u_5 - u_{15}$
$u_8 = 2{,}104{,}573\cdot9$	8 —	61,657·8		$u_8 = 2{,}142{,}346\cdot9$	8 —	61,974·5	
$u_9 = 2{,}042{,}916\cdot1$	9 —	60,680·6		$u_9 = 2{,}080{,}372\cdot4$	9 —	60,929·9	
$u_{10} = 1{,}982{,}235\cdot5$	10 —	59,717·5	602,641·5 =	$u_{10} = 2{,}019{,}442\cdot5$	10 —	59,932·1	606,112·5 =
$u_{11} = 1{,}922{,}518\cdot0$	11 —	58,778·5		$u_{11} = 1{,}959{,}510\cdot4$	11 —	58,979·1	
$u_{12} = 1{,}863{,}739\cdot5$	12 —	57,867·8	Sum =	$u_{12} = 1{,}900{,}531\cdot3$	12 —	58,072·4	Sum =
$u_{13} = 1{,}805{,}871\cdot7$	13 —	56,988·9		$u_{13} = 1{,}842{,}458\cdot9$	13 —	57,207·2	
$u_{14} = 1{,}748{,}882\cdot8$	14 —	56,143·8 ⎭		$u_{14} = 1{,}785{,}251\cdot7$	14 —	56,380·7 ⎭	
$u_{15} = 1{,}692{,}739\cdot0$	....	....		$u_{15} = 1{,}673{,}281\cdot2$	....	....	

The data are now provided for calculating the values of p_x from p_5 to p_{14}, thus—

$$p_5 = \frac{64{,}555\cdot9}{65{,}373} = \begin{array}{l} \text{Logs.} \\ 4\cdot8099359 \\ \overline{-\ 4\cdot8153984} \end{array} = \overline{1}\cdot9945375 = 0\cdot98750.$$

$$p_6 = \frac{63{,}611\cdot6}{64{,}199} = \begin{array}{l} 4\cdot8035363 \\ \overline{-\ 4\cdot8075283} \end{array} = \overline{1}\cdot9960080 = 0\cdot99085.$$

and so on to the end of the series.

The first series of interpolations having now been effected, the remaining four are more easily accomplished, as the terms given are *equidistant*.

The formula of Lagrange might still be employed to obtain the required consecutive number of terms, and the special formulæ would be applicable to each series.

However, there is no need to undertake the laborious work of this method, as there is a much easier and shorter way, which may be described as follows :—

Let the six terms of the series be first set down and differenced, thus—

P − ½d.		$\Delta.$	$\Delta_2.$	$\Delta_3.$	$\Delta_4.$	$\Delta_5.$
u_5	= 6·3608547	−1,322,647 :	−272,649 :	−187,735 :	+ 85,293 :	−202,418 :
u_{15}	= 6·2285900	−1,595,296 :	−460,384 :	−102,442 :	−117,125 :	
u_{25}	= 6·0690604	−2,055,680 :	−562,826 :	−219,567 :		
u_{35}	= 5·8634924	−2,618,506 :	−782,393 :			
v_{45}	= 5·6016418	−3,400,899 :				
u_{55}	= 5·2615519					

The problem is to subdivide these differences for 10-yearly

intervals, represented by the symbol "Δ," into smaller differences "δ," corresponding to one year, or the tenth part of the interval.

The key to the solution of this problem is the formula $\delta^n = (1 + \Delta)^n$—

The working out of the formula to five orders of differences gives the following results :—

$$\delta^5 = \cdot00001\Delta^5.$$
$$\delta^4 = \cdot0001\Delta^4 - 18\delta^5.$$
$$\delta^3 = \cdot001\Delta^3 - 13{\cdot}5\delta^4 - 96{\cdot}75\delta^5.$$
$$\delta^2 = \cdot01\Delta^2 - 9\delta^3 - 44{\cdot}25\delta^4 - 150\delta^5.$$
$$\delta = \cdot1\Delta - 4{\cdot}5\delta^2 - 12\delta^3 - 21\delta^4 - 25{\cdot}2\delta^5.$$

Now this formula must be applied to a *line of* Δ^n *values*. In this case we wish to begin at u_{15}, and it is only necessary to fill in the constant Δ^5 value in the blank space opposite u_{15}. If we wish to apply the formula to the line opposite u_{25}, the proper Δ^4 value would be found by adding together $- 117{,}125$: and $- 202{,}418$:, the sum being $- 319{,}543$: and so on with the other lines.

It is only in the fifth series that this point comes in ; in all the others the interpolation has to be commenced at the second line in the series.

A very important point to regard in using these formulæ is to *take care of the signs*. A negative quantity multiplied by a negative coefficient gives a $+$ value.

Having worked out the formula to the special case now being dealt with, we get this result :—

	δ.	δ^2.	δ^3.	δ^4.	δ^5. *
$u_{15} = 6{\cdot}2285900$	$-142574{:}141989$	$-3230{:}958070$	$-240{:}359575$	$+24{:}72274$	$-2{:}02418$

* These values should be more correctly marked as δu_{15}, $\delta^2 u_{15}$, &c., as showing that they all belong to the line of differences opposite u_{15}.

In order to save the possible waste of labour entailed by working through a 10-yearly series of interpolations, before the values of δ, δ^2, &c., are proved to be correct, it is best to first verify them by the following checking equation :—

$$u_{10} \ (i.e., u_{25}) = u_0 \ (i.e., u_{15}) + 10\delta u_0 + 45\delta^2 u_0 + 120\delta^3 u_0 + 210\delta^4 u_0 + 252\delta^5 u_0.$$

In proceeding with the interpolation δ has first to be added to u_{15}, which will give u_{16}, and then $\delta + \delta^2$ added to u_{16}, &c., thus :—

				$6 \cdot 2285900{:}000{,}000 = u_{15}$
				$-\ 142574{:}141989$
			$-\ 142574{:}141989$	$6 \cdot 2143325{:}858001 = u_{16}$
			$-\ 3230{:}958070$	$-\ 145805{:}100059$
		$-\ 3230{:}958070$	$-\ 145805{:}100059$	$6 \cdot 1997520{:}757952 = u_{17}$
		$-\ 240{:}359575$	$-\ 3471{:}317645$	$-\ 149276{:}417704$
	$-\ 240{:}359575$	$-\ 3471{:}317645$	$-\ 149276{:}417704$	$6 \cdot 1848244{:}340248 = u_{18}$
	$+\ 24{:}722740$	$-\ 215{:}636835$	$-\ 3686{:}954480$	$-\ 152963{:}372184$
$+\ 24{:}72274$	$-\ 215{:}636835$	$-\ 3686{:}954480$	$-\ 152963{:}372184$	$6 \cdot 1695280{:}913064 = u_{19}$
$-\ 2{:}02418$	$+\ 22{:}968560$	$-\ 192{:}938275$	$-\ 3879{:}892755$	$-\ 156843{:}264939$
$+\ 22{:}69856$	$-\ 192{:}938275$	$-\ 3879{:}892755$	$-\ 156843{:}264939$	$6 \cdot 1538437{:}703125 = u_{20}$

and so on ; the interpolation at last reaching .... $6 \cdot 0690604{:}000000 = u_{25}$

If it had been desired to work *upwards*, the process would have been commenced as follows :—

$+\ 24{:}72274$	$-\ 240{:}359575$	$-\ 3230{:}958070$	$-\ 142574{:}141989$	$6 \cdot 2285900{:}000000 = u_{15}$
$+\ 2{:}02418$	$-\ 26{:}746920$	$+\ 267{:}106495$	$+\ 2963{:}851575$	$+\ 139610{:}290414$
$+\ 26{:}74692$	$-\ 267{:}106495$	$-\ 2963{:}851575$	$-\ 139610{:}290414$	$6 \cdot 2425510{:}290414 = u_{14}$

The saving of labour effected by working out an interpolation by *first* obtaining the "leading differences," instead of arriving at these by means of a consecutive number of terms of the series, is so considerable, that although the work described in this paper was done by means of the formulæ already given for Series 1, for the sake of lightening the labour for others, I have, since the manuscript of the paper was written, worked out the following formulæ which have been verified as correct (in the notation u_0 means u_4, the first term of the series) :—

$$\delta^5 u_0 = -\ \frac{20}{7161}\, u_4 + 0 \cdot 004 u_5 + \left(\frac{124(-0 \cdot 1232 u_{10} + 0 \cdot 063 u_{15} - 0 \cdot 011 u_{25}) + 0 \cdot 1848 u_{35}}{7161} \right)$$

$$\delta^4 u_0 = +\ \frac{4}{231}\, u_4 - 0 \cdot 024 u_5 + \left(\frac{2 \cdot 464 u_{10} - 1 \cdot 008 u_{15} + 0 \cdot 088 u_{25}}{231} \right) - 5 \cdot 8 \delta^5 u_0$$

$$\delta^3 u_0 = -\ \frac{1}{11}\, u_4 + 0 \cdot 12 u_5 - 0 \cdot 04 u_{10} + \frac{0 \cdot 12 u_{15}}{11} - 3 \cdot \delta^4 u_0 - 4 \cdot 8 \delta^5 u_0$$

$$\delta^2 u_0 = +\ \frac{4}{11}\, u_4 - 0 \cdot 44 u_5 + 0 \cdot 08 u_{10} - \frac{0 \cdot 04 u_{15}}{11} - \delta^3 u_0 + 1 \cdot 2 \delta^5 u_0$$

$$\delta u_0 = +\ u_5 - u_4$$

In using these formulæ the labour may be diminished by the following simple device : Let u_0 (*i.e.*, u_4) be subtracted from *all* the terms of the series. Then all the terms in the formulæ containing u_4 will vanish by being reduced to zero. The *new*

values must be applied then in the calculations. Thus, u_5 will be $u_5 - u_4$, u_{10} will be $u_{10} - u_4$, &c., &c. The differences thus obtained will be *exactly the same*, as if the formulæ had been applied to the original terms. Thus :—

Original Terms.	Differences.	New Terms.	Differences.
u_4	$u_5 - u_4$	$u_4 - u_4$	$u_5 - u_4$
u_5	$u_{10} - u_5$	$u_5 - u_4$	$u_{10} - u_5$
u_{10}	....	$u_{10} - u_4$	

Having obtained the values of $\delta^5 u_0$, $\delta^4 u_0$, &c., let the original u_4 be placed as u_0. The interpolation may then be proceeded with exactly as already described for Series 2.

The values found may then be verified as correct by the following " checking equation " :—

$$u_6(i\ e.,\ u_{10}) = u_0(i.e.,\ u_4) + 6\delta u_0 + 15\delta^2 u_0 + 20\delta^3 u_0 + 15\delta^4 u_0 + 6\delta^5 u_0.$$

Process of " Welding," or combining two Series.

It remains now to explain the process by which the u_x values of two adjoining series are so blended together as to make the one series pass into the other by even gradations, instead of having the irregularity in the p_x curve, which must be obtained by simply placing different series end to end.

This process has been devised by Mr. A. C. Waters, and to him I am indebted for the knowledge of it.

The values of the blending proportions have been worked out from trigonometrical tables.

It will be noted that the sum of each of the pairs of multipliers $= 1$.

The process is shown below as applied to the series u_{16} to u_{24}.

P−½d. From Series 1. From Series 2. Combined Values.
$u_{16} = 6 \cdot 2141570 \times 0 \cdot 976 + 6 \cdot 2143326 \times 0 \cdot 024 = 6 \cdot 2141612$
$u_{17} = 6 \cdot 9994423 \times 0 \cdot 904 + 6 \cdot 1997521 \times 0 \cdot 096 = 6 \cdot 1994720$
$u_{18} = 6 \cdot 1844257 \times 0 \cdot 794 + 6 \cdot 1848244 \times 0 \cdot 206 = 6 \cdot 1845078$
$v_{19} = 6 \cdot 1690863 \times 0 \cdot 654 + 6 \cdot 1695281 \times 0 \cdot 346 = 6 \cdot 1692392$
$u_{20} = 6 \cdot 1534024 \times 0 \cdot 500 + 6 \cdot 1538438 \times 0 \cdot 500 = 6 \cdot 1536231$
$u_{21} = 6 \cdot 1373525 \times 0 \cdot 346 + 6 \cdot 1377542 \times 0 \cdot 654 = 6 \cdot 1376152$
$u_{22} = 6 \cdot 1209146 \times 0 \cdot 206 + 6 \cdot 1212441 \times 0 \cdot 794 = 6 \cdot 1211762$
$u_{23} = 6 \cdot 1040672 \times 0 \cdot 096 + 6 \cdot 1042997 \times 0 \cdot 904 = 6 \cdot 1042774$
$u_{24} = 6 \cdot 0867893 \times 0 \cdot 024 + 6 \cdot 0869088 \times 0 \cdot 976 = 6 \cdot 0869060$

This process is facilitated by deducting the largest possible *common value* from the pairs of u_x values before multiplying, and then adding the two products to this common value. Thus—

$$u_{16} = 6 \cdot 2140000 + 1570 \colon \times 0 \cdot 976 + 3326 \colon \times 0 \cdot 024 = 6 \cdot 2141612.$$

The following diagram shows the curve of p_x from age 15 to age 24 as worked out (a) for each of the two series separately, and (b) from the blended values.

The dotted line shows the blended curve.

Series 1

Series 2

The diagram has only been roughly drawn from an original large one plotted out to scale.

For the sake of clearness the curves have been a little exaggerated.

Sufficient explanation and illustration, it may be hoped, have now been given to clearly demonstrate the whole of the processes of calculation necessary to obtain the p_x values right on to the end.

The values from age 85 onwards are to be obtained by continuing downwards the interpolations in the series ending with u_{85}. To check the accuracy of the results, the value of u_{95} can be previously obtained from the Δ^n values of the series by carrying them down one stage. The interpolation may have to be continued at least as far as u_{100}. If it is found when the l_x column comes to be worked out that it is necessary to proceed further, this can easily be done.

In working out the successive p_x values, a very important practical point is to *difference* them as you go along, and also to plot them out to scale on paper ruled into squares. If irregularities in the differences, or breaks in the symmetry of the curve are met with, *errors in calculation have been made.*

It may also be remarked that it is necessary to use *all* the seven figures to be obtained by translating the logs. into numbers, right on to the end, to get the smooth gradations and regular differences to be obtained in the p_x series by the use of the method of interpolation recommended.

Calculation of the l_x Column.

Having now obtained the logs. of the complete series of p_x values, the next stage in Life-Table construction is to proceed with the calculation of the l_x column; that is, the number of survivors at each successive year of age out of a given number supposed to set out on the journey of life at birth.

It really does not matter what number is so taken; the final results of E_x values, that is, the expectation of life at each age, might as readily be arrived at by taking one hundred as by taking a million.

It is usual, however, to divide up a hundred thousand or a million in the proportions of male and female births for the decennial period for which the Life-Table is being worked out.

The advantage of this procedure is that it is thus possible to make a combined Life-Table for *persons*, that is, males and females taken together, as regards the number of survivors at the respective ages out of the supposed original hundred thousand or million at birth.

In the example now being considered, Manchester City (males), the l_0 number is 50,764.

The point at which the new calculation is to be commenced is at age 5, at which age the number of survivors, l_5, is reduced to 34,467.

By multiplying this number by the fraction ·98750, which has been calculated as the value of p_5, the number of survivors at age 6 is obtained, and so on.

The calculations are of course made by means of logarithms. Thus :—

$$
\begin{aligned}
l_5 \;=\; 34{,}467 &&&=\;\; 4\cdot5374035 \\
&\times\; p_5 \;=\; \cdot98750 &&=\;+\overline{1}\cdot9945375 \\[2pt]
\hline
l_6 \;=\; 34{,}036 &&&=\;\; 4\cdot5319410 \\
&\times\; p_6 \;=\; \cdot99085 &&=\;+\overline{1}\cdot9960080 \\[2pt]
\hline
l_7 \;=\; 33{,}725 &&&=\;\; 4\cdot5279490 \\
&\times\; p_7 \;=\; \cdot99325 &&=\;+\overline{1}\cdot9970599 \\[2pt]
\hline
l_8 \;=\; 33{,}497 &&&=\;\; 4\cdot5250089 \\
&\times\; p_8 \;=\; \cdot99489 &&=\;+\overline{1}\cdot9977750 \\[2pt]
\hline
l_9 \;=\; 33{,}326 &&&=\;\; 4\cdot5227839 \\
&\times\; p_9 \;=\; \cdot99591 &&=\;+\overline{1}\cdot9982193 \\[2pt]
\hline
l_{10} \;=\; 33{,}190 &&&=\;\; 4\cdot5210032
\end{aligned}
$$

This series of calculations is proceeded with until there are no more survivors, that is, until a negative "characteristic" is obtained in the log. of l_x.

It is clear that if a million has been taken as the l_0 number, they will not all be extinct so soon as if only one-tenth part of the number has been commenced with. That is, it will require perhaps two or three more additional p_x values to get a negative characteristic in the case of a million than in the case of a hundred thousand. This mathematical necessity obviously corresponds to the actual facts, for out of an original million there is more

probability of having a few survivors at extreme ages than out of a tenth part of the number.

For the sake of having a uniform standard of comparison for the number of survivors at each age, it is usual to calculate another l_x column showing the numbers of males or females surviving at each age out of a hundred thousand or million starting at birth.

This may be done—

(*a*.) By making a calculation by means of the p_x values exactly similar to that above described, but taking a hundred thousand or a million as the l_0 value.

(*b*.) Or by a series of proportions, if 34,467 survive at age 5 out of 50,764 at birth, how many would survive out of 100,000? And so on.

d_x *Column.*

This, although it is usually placed *before* the l_x column, must be calculated *after* it.

For the number dying in the first year of life in the Life-Table population must necessarily be the difference between those surviving at age 1 and those starting at birth, or generally, $d_x = l_x - l_{x+1}$.

P$_x$ *Column.*

This column, which represents the mean number living during each year of life, is to be taken for every year of life *except the first*, as the arithmetical mean of the number beginning and the number ending the year of life.

Thus generally, $P_x = \dfrac{l_x + l_{x+1}}{2}$.

The same number which expresses the *mean population* will also represent the *years of life lived* during the year x to $x + 1$ by the number of survivors l_x entering upon that year.

The value of P_0, that is, the mean number living in the first year of life, may be worked out in two ways:

(*a*.) Having, in the data for the ten years for which the Life-Table is being calculated, the number of infants dying under 6 months of age out of the whole number dying under 1 year of age, it is a simple matter of proportion to find out how many of the d_0 numbers of the Life-Table have died by the middle of the year; it will be more than half, and deducting this number from l_0, will give the value of P_0.

(*b*.) Or if the numbers being dealt with are small enough to permit of a direct calculation of the *mean age at death* of those dying during the ten years under 1 year of age, then multiplying this by the number d_0 of the Life-Table, and adding the result to l_1 of the Life-Table, will give the value of P_0.

Taking the arithmetical mean of l_x and l_{x+1} as the value of P_x is exactly equivalent to allowing half a year each to those dying in the interval from age x to age $x + 1$—

$$\text{Thus } P_x = l_{x+1} + \frac{d_x}{2}$$

Practically it will be found that for the first year of life 0·4 year has to be allowed instead of 0·5 as for the succeeding years.

In some Life-Tables the geometrical mean of l_x and l_{x+1} has been taken as the value of P_x.

The differences in the E_x values by this procedure are insignificant except at the later ages of life.

In the Life-Table for Haydock, published in 1898, I have given, by the help of Mr. A. C. Waters, a full discussion of this point. It would occupy too much space to repeat all this here, and it is not necessary, as the considerations presented apply more to "abbreviated" Life-Tables than to extended ones. It may suffice to simply draw attention to the fact that if the l_x values of a complete Life-Table are plotted out in a curve, this curve will be found to be *convex upwards* during the greater part of the curve, that is, from age 15 to age 70. Seeing that the problem of calculating the years of life lived by l_x from age x to age $x + 1$, resolves itself, geometrically considered, into calculating the area of a figure bounded below by a horizontal line, the "abscissa," at the sides by the ordinates l_x and l_{x+1}, and at the top by the intercepted portion of the l_x curve, and that taking the arithmetical mean of l_x and l_{x+1}, is equivalent to making this intercepted portion of the l_x curve a straight line, and that taking the geometrical mean is equivalent to taking a rather deep *concave* curve, it follows that taking the arithmetical mean must give for the greater part of the Life-Table l_x curve a result rather *less* than the true one, but certainly nearer to the truth than taking the geometrical mean would give.

The Q_x Column.

When the P_x column is completed, by successive additions beginning from below, the Q_x column can be constructed.

It represents the years of life lived by l_x during the year $x + 1$ and *during all the years afterwards to the end of the Life-Table*. It also represents the complete Life-Table population at each age x and upwards.

For merely local Life-Tables it is not really necessary to work out the E_x values for every separate year of life. It is sufficient to do this at quinquennial age intervals.

It is therefore a simple matter to calculate from the l_x values the values of $Q_x - Q_{x+5}$, for

$$\Sigma P_x \text{ to } P_{x+4},^2 \text{ or } Q_x - Q_{x+5} = \frac{l_x + 2(l_{x+1} + l_{x+2} + l_{x+3} + l_{x+4}) + l_{x+5}}{2}$$

$$= \frac{l_x + l_{x+5}}{2} + l_{x+1} + l_{x+2} + l_{x+3} + l_{x+4}.$$

Therefore the value of $Q_5 - Q_{10}$ (to take the example already given of calculating l_x values)

$$= \frac{34{,}467 + 33{,}190}{2} + 34{,}036 + 33{,}725 + 33{,}497 + 33{,}326 = 168{,}412 \cdot 5.$$

The E_x *Column.*

This column, which it is the final object of a life-table to produce, may now be readily calculated, seeing that Q_x represents the total years of life lived by l_x survivors during the year $x+1$, and during all the succeeding years to the end of the Life-Table, it is obvious that the expectation of life, or mean after-lifetime of any individual among the l_x number, is Q_x divided by l_x,

$$\text{or } E_x = \frac{Q_x}{l_x}.$$

The mode of calculation is as follows for quinquennial age periods, beginning from below and working upwards, and thus working out the Q_x and the E_x columns simultaneously.

			logs.		
Q_{95}	$=$	$22 \cdot 055$	$\dfrac{Q_{95}}{l_{95}} = $	$\dfrac{1 \cdot 3435071}{-1 \cdot 0704136} = 0 \cdot 2730935 = 1 \cdot 88 = E_{95}.$	
$+ \Sigma P_{90} \text{ to } P_{94} =$	$+$	$202 \cdot 23$			
Q_{90}	$=$	$224 \cdot 285$	$\dfrac{Q_{90}}{l_{90}} = $	$\dfrac{2 \cdot 3508002}{-1 \cdot 9518371} = 0 \cdot 3989631 = 2 \cdot 51 = E_{90}.$	
$+ \Sigma P_{85} \text{ to } P_{89} =$	$+$	$1{,}106 \cdot 2$			
Q_{85}	$=$	$1{,}330 \cdot 5$	$\dfrac{Q_{85}}{l_{85}} = $	$\dfrac{3 \cdot 1240149}{-2 \cdot 6189725} = 0 \cdot 5050424 = 3 \cdot 20 = E_{85}.$	
$+ \Sigma P_{80} \text{ to } P_{84} =$	$+$	$4{,}035 \cdot 4$			
Q_{80}	$=$	$5{,}366$	$\dfrac{Q_{80}}{l_{80}} = $	$\dfrac{3 \cdot 7296507}{-3 \cdot 1207205} = 0 \cdot 6089302 = 4 \cdot 06 = E_{80}.$	

The above examples will show clearly how this series of calculations is to be continued to the end.

In order to avoid confusion, it should be noted that some life-tables, as for example the one for Brighton, have been worked out without bringing in the P_x column.

Instead of this a column called the $\Sigma l x_{+1}$ column is con-

---

[2] That is the sum of the values of P^x, P_{x+1}, P_{x+2}, P_{x+3}, P_{x+4}.

structed. That is, opposite the l_x number is placed the number of survivors at age $x+1$ and upwards. Then $\dfrac{\Sigma l_{x+1}}{l_x}$ will give what is called the "curtate expectation of life," that is, the average number of years lived by l_x, without regard to the parts of years lived by those dying in the interval from age x to age $x+1$.

The complete expectation of life will then be given by the formula $\mathrm{E}_x = \dfrac{\Sigma l_{x+1}}{l_x} + 0.5$, or, in the case of the first year of life,

$$\mathrm{E}_0 = \frac{\Sigma l_1}{l_0} + 0.4.$$

The method, however; previously described is to be preferred.

The work of an extended Life-Table for Manchester City (males) being now completed, the E_x values at quinquennial age intervals have been deduced as follows :—

	New Values.	Values in the Published Life-Table.	Differences of New from Published Values.
E_0	35·10	34·71	+ 0·39
E_5	46·16	45·59	+ 0·41
E_{10}	42·86	42·75	+ 0·11
E_{15}	38·62	38·78	− 0·16
E_{20}	34·63	34·62	+ 0·01
E_{25}	30·75	30·69	+ 0·06
E_{30}	27·09	27·08	+ 0·01
E_{35}	23·74	23·76	− 0·02
E_{40}	20·67	20·68	− 0·01
E_{45}	17·80	17·80	± 0·00
E_{50}	15·08	15·06	+ 0·02
E_{55}	12·53	12·49	+ 0·04
E_{60}	10·20	10·16	+ 0·04
E_{65}	8·18	8·15	+ 0·03
E_{70}	6·50	6·48	+ 0·02
E_{75}	5·15	5·11	+ 0·04
E_{80}	4·06	4·02	+ 0·04
E_{85}	3·20	3·16	+ 0·04
E_{90}	2·51	2·48	+ 0·03
E_{95}	1·88	1·86	+ 0·02

As will be made to appear afterwards, the divergences at the earlier ages depend upon different modes of interpolating the p_x values from age 5 to age 15. At the later ages they depend upon the P_x values of the published Life-Table, having been calculated from the geometric means of l_x and l_{x+1}.

Section II.

Description of a Modification of Dr. Farr's "Short" Method of constructing a Local Life-Table.

The labour involved in working out an "extended" life-table by the previously described method is, it must be admitted, very

considerable, and may only too probably deter many from under-
taking the task.

It is of importance, therefore, to ascertain whether there may
not be a shorter way to arrive at the E_x values at quinquennial
age intervals, giving for practical purposes a sufficiently near
approximation to the values which *would be obtained* by the more
laborious method.

The late Dr. William Farr, as has been already mentioned in
the introductory remarks, devised a "short method" which, as
applied by him to the data upon which his Life-Table No. 3 of
England and Wales (males) was founded, gave E_x values at the
earlier ages very near to the true ones, but at the later ages, and
especially after age 65, the discrepancies in the direction of excess
were very considerable.

Up to the point at which the p_x values for the first five years of
life have been worked out, and the value of l_5 determined, the
work to be done is exactly the same as for the extended Life-Table;
there is no short method for the first quinquennial age-period.

If the work up to the point indicated has been completed, and
it is desired to take a "royal road" beyond, and avoid what, on
first view, is certainly the appalling labour of interpolation, the
following is the procedure to be adopted.

From the data of population and deaths at the various age-
periods, it is a very simple matter of calculation to ascertain the
mean p_x values for each of the age-periods.

Thus for any quinquennial or decennial age-period

$$\text{log. } \overline{\text{P} - \tfrac{1}{2}d} - \text{log. } \overline{\text{P} + \tfrac{1}{2}d} = \text{log. } p_{x \text{ to } x + n}$$

n being 5 or 10 as the case may be.

Still keeping to the example of Manchester City (males), the
calculations are effected as follows:—

Age Periods.	$\dfrac{\text{P} - \tfrac{1}{2}d}{\text{P} + \tfrac{1}{2}d}$		Logs.		
5—10	$\dfrac{314{,}343 - 1{,}198}{314{,}343 + 1{,}198}$	$= \dfrac{313{,}145}{315{,}541}$	$= \begin{array}{c}5{\cdot}4957455 \\ -5{\cdot}4990558\end{array}$	$= \overline{1}{\cdot}9966897$	$= 0{\cdot}99241$
10—15	$\dfrac{290{,}034 - 537{\cdot}5}{209{,}304 + 537{\cdot}5}$	$= \dfrac{289{,}496{\cdot}5}{290{,}571{\cdot}5}$	$= \begin{array}{c}5{\cdot}4616435 \\ -5{\cdot}4632531\end{array}$	$= \overline{1}{\cdot}9983904$	$= 0{\cdot}99630$
15—25	$\dfrac{521{,}994 - 1{,}613{\cdot}5}{521{,}994 + 1{,}613{\cdot}5}$	$= \dfrac{520{,}380{\cdot}5}{523{,}607{\cdot}5}$	$= \begin{array}{c}5{\cdot}7163210 \\ -5{\cdot}7190058\end{array}$	$= \overline{1}{\cdot}9973152$	$= 0{\cdot}99384$

We proceed thus until the value of log. p_{85-95} is obtained. As
has been already explained, the data for age 95 and upwards are
unreliable; whereas the value of p_{85-95} is found to be 0·72985, the

value of p_{95-} from the actual data works out to 0·94286, a manifestly absurd result.

To overcome this difficulty and obtain a rational working value of p_{95-}, the following method is proposed :—

Let the logs of the four preceding p_x values be set down in a column and differenced. By carrying the differences downwards for one stage, a fifth equidistant value is to be obtained, which may be taken as the value of p_{95-} required.

			1st Differences.	2nd Differences.	3rd Difference.
Log. p_{55-65}	$= \bar{1}\cdot9763671$		$- 0\cdot0209885$	$- 0\cdot0137529$	$- 0\cdot0089122$
,, p_{65-75}	$= \bar{1}\cdot9553786$		$- 0\cdot0347414$	$- 0\cdot0226651$	
,, p_{75-85}	$= \bar{1}\cdot9206372$		$- 0\cdot0574065$		
,, p_{85-95}	$= \bar{1}\cdot8632307$				

Then log. $p_{95-} =$
$\bar{1}\cdot8632307 - (0\cdot0574065 + 0\cdot0226651 + 0\cdot0089122) = \bar{1}\cdot774242469 = 0\cdot59463.$

The following table shows the comparison of the mean p_x values thus deduced, with the means of the separate yearly values previously worked out by the extended method which has been described :—

Age Periods.	Mean p_x Values.		Difference of (b) from (a).
	By Short Method (b).	By Extended Method (a).	
5—10................	0·99241	0·99247	— 0·00006
10—15................	0·99630	0·99630	± 0·00000
15—25................	0·99384	0·99380	+ 0·00004
25—35................	0·98903	0·98890	+ 0·00013
35—45................	0·98064	0·98037	+ 0·00027
45—55................	0·96933	0·96872	+ 0·00051
55—65................	0·94704	0·94514	+ 0·00190
65—75................	0·90236	0·89665	+ 0·00571
75—85................	0·83299	0·81742	+ 0·01557
85—95................	0·72985	0·70007	+ 0·02978
95—	0·59463	0·58632	+ 0·00831

In proceeding to the next stage of the calculation, viz., the obtaining of the l_x values, it must be noted that to get l_{10}, l_5 must be multiplied by five times the value of p_{5-10}; to get l_{15}, l_{10} must be multiplied by five times the value of p_{10-15}; and to get l_{25}, l_{15} must be multiplied by ten times the value of p_{15-25}. That is—

$$\log. l_5 = \quad 4\cdot5374035$$
$$+ \log. p_{5-10} \times 5 = + \bar{1}\cdot9834485$$
$$= \quad 4\cdot5208520 = 33{,}178 = l_{10},$$

and so on.

We shall then obtain the series of l_x values tabulated below :—

		By Short Method (b).	By Extended Method (a).	Differences of (b) from (a).
l_{10}	=	33,178	33,190	− 12
l_{15}	=	32,569	32,580	− 11
l_{25}	=	30,617	30,615	+ 2
l_{35}	=	27,420	27,381	+ 39
l_{45}	=	22,551	22,458	+ 93
l_{55}	=	16,516	16,344	+ 172
l_{65}	=	9,585	9,296	+ 289
l_{75}	=	3,431	3,123	+ 308
l_{85}	=	552	416	+ 136
l_{95}	=	24	12	+ 12

From what has been previously said it will be easily compre-
hended that the next step, the calculation of the P_x values, is to
be effected thus :—

$$P_{5-10} = \frac{l_5 + l_{10}}{2} \times 5$$

$$P_{10-15} = \frac{l_{10} + l_{15}}{2} \times 5$$

$$P_{15-25} = \frac{l_{15} + l_{25}}{2} \times 10$$

and so on. Having then obtained all these values, the Q_x and E_x
values can be proceeded with as described in the method for the
extended Life-Tables. Finally, the series of E_x values shown below
are obtained :—

		By Short Method (b).	By Extended Method (a).	Differences of (b) from (a).
E_0	=	35·34	35·10	+ 0·24
E_5	=	46·52	46·16	+ 0·36
E_{10}	=	43·23	42·86	+ 0·37
E_{15}	=	38·99	38·62	+ 0·37
E_{25}	=	31·15	30·75	+ 0·40
E_{35}	=	24·20	23·74	+ 0·54
E_{45}	=	18·35	17·80	+ 0·55
E_{55}	=	13·23	12·53	+ 0·70
E_{65}	=	9·18	8·18	+ 1·00
E_{75}	=	6·68	5·15	+ 1·53
E_{85}	=	5·43	3·20	+ 2·23
E_{95}	=	5·00	1·88	+ 3·12

Now these results, while at the earlier ages giving a moderately
close approximation to the true E_x values, can scarcely at the
later ages be considered as altogether satisfactory.

When we come to analyse the reasons for the progressively
increasing discrepancies in the direction of excess, it is found that
they are of a twofold nature :

(1.) The mean p_x values of the short method, as has been previously shown, tend to become at the successive age-periods greater and greater than the corresponding mean values of the extended method. From this it follows that the l_x values also become greater and greater than those of the extended method, and the P_x values or the years of life lived by l_x in the interval between age x and age $x + 10$ *increase in greater proportion than* l_x *increases.*

(2.) However, even if we could get the mean p_x values to exactly correspond and thus obtain *identical* l_x values, there would still be differences due to the calculation of the years of life lived between age x and age $x + 10$ by *one* stage instead of in the ten successive stages of the extended method.

The extent of these differences can be readily measured by working out the E_x values to be derived from the l_x values of the extended method (*a*), by the same process as that which has been adopted for the values in the short method (*b*) (that is, the l_5, l_{10}, l_{15}, &c., values are taken without regard to the intermediate l_x values).

When this is done the following comparative results are obtained :—

Table showing the Differences of the P_x, Q_x, *and* E_x *Values obtained by Calculation from the* l_x *Values of the Extended Life Table at Quin-quennial Age Intervals for the Age Periods 5—10 and 10—15, and afterwards at Decennial Age Intervals, from the Corresponding Values in the Extended Life Table.*

Age.	Differences in Years of Life or P_x Column.	Differences in Q_x Column.	Differences in E_x Column.	*
0	o	+ 2404	+ 0·05	+ 0·19
5	+ 730	+ 2404	+ 0·07	+ 0·29
10	− 48	+ 1674	+ 0·05	+ 0·32
15	− 817	+ 1722	+ 0·05	+ 0·32
25	− 1354	+ 2539	+ 0·08	+ 0·32
35	− 1133	+ 3893	+ 0·14	+ 0·40
45	− 890	+ 5026	+ 0·22	+ 0·33
55	− 571	+ 5916	+ 0·36	+ 0·34
65	+ 2668	+ 6487	+ 0·69	+ 0·31
75	+ 2950	+ 3819	+ 1·22	+ 0·31
85	+ 831	+ 869	+ 2·09	+ 0.14
95	+ 38	+ 38	+ 3·12	± 0·00

The figures in the column * are the differences of the differences in the preceding column from the total differences of the E_x values obtained by the short method, from the corresponding values of the extended Life-Table, and may therefore be considered to *measure the variation due to the differences of the* p_x *values.*

Simple geometrical considerations based on the shape of the life-table l_x curve will explain the varying values of P_x as given in the above analysis.

The same considerations will show that if similar calculations had been made from the l_x values of the extended Life-Table *at quinquennial age intervals throughout*, the differences would have been less marked than in the case of the ten-yearly intervals. This was demonstrated in a paper published in "Public Health" for July, 1898, by means of a table which I had worked out from the l_x values of the Life-Table for England and Wales (males). To economise space this need not be copied here.

The possibility thus suggests itself of elaborating Dr. Farr's original short method by working out mean p_x values all throughout for quinquennial age intervals.

However, although at the census enumerations the population numbers are given at quinquennial age intervals, these *numbers are too unreliable to work with*, owing to misstatements of age and the tendency to state ages in round numbers.

The first attempt at Life-Table construction which I made was for Haydock, using the census numbers at quinquennial age intervals, and the results were very rugged and uneven.

The required intermediate p_x values may be obtained by interpolations in the logs. of the u_x values of (Population $-\frac{1}{2}$ deaths) and (Population $+\frac{1}{2}$ deaths) of a much simpler and easier nature than those previously described for the extended method, as only three orders of differences need be taken.

The problem is, given u_5, u_{15}, u_{25}, u_{35}, to interpolate u_{20}. By the required special application of Lagrange's general formula—

$$u_{20} = \frac{10(u_{15} + u_{25}) - (u_5 + u_{15} + u_{25} + u_{35})}{16}$$

Similarly u_{30} can be worked out from u_{15}, &c., and so on, until u_{70} has been interpolated.

u_{80} has to be obtained from u_{65}, u_{70}, u_{75}, u_{85}. Thus—

$$u_{80} = \frac{u_{65} + u_{85}}{4} + 1\tfrac{1}{2}u_{75} - u_{70}.$$

The differences of the last four terms of the series now obtained, viz., u_{70}, u_{75}, u_{80}, u_{85} may be continued downwards, and then u_{90}, u_{95}, and u_{100} may be obtained.

I have worked out by this method also a Life-Table for Manchester City (males). To save space, only the final results are quoted below:—

Differences of E_x *Values from the Values of the Extended Life-Table.*

At Age 0.	5.	10.	15.	20.	25.	30.	35.	40.	45.
+ 0·06	+ 0·10	+ 0·10	+ 0·09	+ 0·11	+ 0·11	+ 0·13	+ 0·12	+ 0·16	+ 0·14

At Age 50.	55.	60.	65.	70.	75.	80.	85.	90.	95.
+ 0·15	+ 0·18	+ 0·20	+ 0·25	+ 0·32	+ 0·39	+ 0·49	+ 0·62	+ 0·77	+ 0·87

These results show a very great improvement on those previously given by the short method for decennial age intervals.

Description of the Special Modification of the Short Method Recommended.

I shall hope to show, however, that by a very simple modification of Dr. Farr's method, even still closer approximations to the E_x values of the extended method are to be obtained.

Very early in my first attempts at working out a Life-Table for Haydock, I stumbled upon the discovery that in working with mean values of p_x for ten-yearly periods, the value of P_x for the ten-yearly period is *less* if the calculation is made from l_x to l_{x+10} by *two* stages instead of *one*.

Thus assuming that we have a population of 16,000 at age 75, and that this number is reduced to one-fourth part, or 4,000, by age 85, the mean value of $p_{x\ to\ x+10}$, or the chance of living one year in the interval from age x to age $x+10$ would be 0·87055, or $16,000 + (0·87055)^{10} = 4,000$.

By the *one* stage calculation of Dr. Farr's method the value of $P_{x\ to\ x+10} = \dfrac{16,000 + 4,000}{2} \times 10 = 100,000$.

By calculating in *two* stages we have this result :—

(1.) $16,000 \times (0·87055)^5 = 8,000$.
(2.) $8,000 \times (0·87055)^5 = 4,000$.

and the years of life lived in the interval from age_{75} to age_{85}

$$= \left(\frac{16,000 + 8,000}{2} + \frac{8,000 + 4,000}{2} \right) \times 5 = 90,000.$$

It then occurred to me that it might be possible thus to obtain values of E_x more closely approximating to those of an extended Life-Table. On submitting the idea to the test of experiment I obtained very close approximations to the true values as far as E_{65}; after this the results were increasingly too great.

The further idea then struck me that it might be possible by

further increasing the number of stages of the calculation I still might obtain better results.

Thus to take the case of a calculation in four stages :—

$$(1.) \quad 16,000 \times (0\cdot87055)^{2\frac{1}{2}} = 11,314.$$
$$(2.) \quad 11,314 \times (0\cdot87055)^{2\frac{1}{2}} = 8,000.$$
$$(3.) \quad 8,000 \times (0\cdot87055)^{2\frac{1}{2}} = 5,656.$$
$$(4.) \quad 5,656 \times (0\cdot87055)^{2\frac{1}{2}} = 4,000.$$

By this calculation the years of life lived in the interval from age 75 to age 85 would be—

$$\left(\frac{16,000 + 2(11,314 + 8,000 + 5,656) + 4,000)}{2}\right) \times 2\tfrac{1}{2} = 87,425.$$

Similarly the calculation might be made in five or in ten stages, with increasing diminution in the years of life obtained.

The results may be represented more clearly in a tabular form :—

16,000 *reduced to* 4,000 *in Ten Years.*

Stages of Calculation.	Years of Life.	Stages of Calculation.	Years of Life.
1	100,000	5	87,116
2	90,000	10	86,701
4	87,425	An infinite number	86,511·1

The last value is to be obtained by the formula $\dfrac{l_x - l_{x+10}}{\text{hyp. log. } \dfrac{l_x}{l_{x+10}}}$

A simple geometrical construction will make this point clear.

By the hypothesis which is assumed, that the death-rate or "force of mortality" remains constant during the ten years' interval for age 75 to age 85, in calculating the years of life lived during this interval, we have to determine the area of a figure bounded below by a horizontal line, the "abscissa," upon which are erected at a distance apart corresponding to ten years two vertical lines or "ordinates" representing to scale l_x and l_{x+10}; now the curve joining the upper extremities of these ordinates would be approximately constructed by erecting successive ordinates at distances apart corresponding to one year, each one 0·87055 the length of the preceding one, and joining these extremities by a series of straight lines. There would be thus obtained an approach to the "logarithmic curve," or the "curve "of equal proportional decrements."

The *true* area of the figure would be determined by conceiving of the distances between the successive ordinates being infinitely small, and is to be obtained by the formula already given.

Taking the arithmetical mean of l_x and l_{x+10} multiplied by 10 is

equivalent to making the " curve " joining the extreme ordinates
a straight line.

A reference to the diagram will make it apparent that the
total area of the *two* four-sided figures formed by joining the end
of the middle ordinate with the ends of the extreme ordinates,
is much less than the *one* figure formed by joining the ends of the
extreme ordinates, and also that the greater the number of sections
in which the area of the whole figure is calculated, the nearer will
be the approximation to the true area which is bounded above by
the logarithmic curve, which is indicated by the dotted line.

I have submitted this idea to the test of experiment to find
out the most simple and most accurate application of the many
possible variations in the mode of calculating the years of life for
successive decennial age-periods.

As the result I propose the following scheme :—

(1.) For each of the age periods 15—25 to 65—75 inclusive, to
make the calculation in two stages.

(2.) For the two age periods 75—85 and 85—95, to make the
calculation in *four* stages.

(3.) From age 95 to continue the calculation to the end by
yearly stages.

Starting again with the data (a) the log. of l_5, and (b) the logs.
of the mean p_x values, as previously worked out and tabulated for
Dr. Farr's original method, the following results have been obtained
for Manchester City (males) by the application of the suggested
scheme :—

E_0 = 35·10	E_{15} = 38·62	E_{45} = 17·80	E_{75} = 5·15
E_5 = 46·16	E_{25} = 30·75	E_{55} = 12·53	E_{85} = 3·20
E_{10} = 42·86	E_{35} = 23·74	E_{65} = 8·18	E_{95} = 1·88

From these values it is possible by a simple process of interpo-
lation to obtain the intermediate values for the even ages 20,
30, &c.

It must be noted that the intermediate values of l_{x+5}, which
have been obtained in the calculation of l_{x+10} by two stages *are*

not available for working out the E_{x+5} *values.* If so used they give widely divergent results. They are of no further use than the one to which they have already been put.

Formulæ have to be used corresponding to those which have already been given for working out intermediate quinquennial values in the logs. of the u_x values of $(P - \frac{1}{2}d)$, and $(P + \frac{1}{2}d)$, but in this case they need only be applied to the E_x *numbers.*

$$\text{Thus } E_{30} = \frac{10 (E_{25} + E_{35}) - (E_{15} + E_{25} + E_{35} + E_{45})}{16}.$$

This formula, with the needed obvious changes in the suffixes of E_x, is applicable as far as E_{80}.

The rule simply is, given the four equidistant terms to work with, *from ten times the sum of the two middle terms subtract the sum of all four terms and divide the remainder by* 16; *then the result is the central term required.*

I have found as a rule that it is best not to bring in E_5, so that E_{20} is to be deduced thus

$$E_{20} = \frac{E_{15} + E_{35}}{4} + 1\frac{1}{2} E_{25} - E_{30}.$$

Finally

$$E_{90} = \frac{E_{75} + E_{95}}{4} + 1\frac{1}{2} E_{85} - E_{80}.$$

These two last formulæ may be reduced to the common rule— where at the top and bottom of the series there are only three original terms to work with, together with a fourth term already interpolated, *to one-fourth of the sum of the two outside terms add one and a half times the inner term and subtract from the sum the value of the term already interpolated.*

These interpolations having been effected, the final results come out as follows :—

Differences of the E_x *Values from the Corresponding Values of the Extended Life-Table.*

At age 0.	5.	10.	15.	20.	25.	30.	35.	40.	45.
$- 0.02$	-0.03	-0.04	-0.04	-0.07	-0.03	$+0.01$	-0.01	-0.01	± 0.00

At age 50.	55.	60.	65.	70.	75.	80.	85.	90.	95.
$- 0.01$	$+0.02$	$+0.06$	$+0.07$	$+0.08$	$+0.05$	$+0.07$	$+0.08$	$+0.04$	$+0.04$

It is thus apparent that by this extremely simple method E_x values at quinquennial age intervals are to be obtained approximating to those of the extended Life-Table with a **very**

remarkable nearness, the differences indeed being less than the probable differences due to inaccuracies in the foundation figures from erroneous statements of the ages of the living and of the dying.

It would not be safe to generalise too much from one particular instance, but in the next section of this paper additional examples will be given which need not at this point be inserted.

Section III.

From want of space the whole of this section (including diagrams) has had to be excluded from publication in the present number of the *Journal*.

It is to appear among the "Miscellanea" of one or more succeeding numbers.

The following is a synopsis of the matters dealt with in this section :—

(1.) Reasons why the values of p_5 to p_{24} have been calculated by interpolations in the series u_4, u_5, u_{10}, u_{15}, u_{25}, u_{35}.

(*a.*) It is not a matter of indifference what series is taken, as by different series from the same data values of E_0 and E_5 are to be obtained differing from each other by as much as a whole year.

(*b.*) The "ideal" curve is considered as to its relations to the mean values of p_x to be obtained from the population and death numbers of the three age-groups 5—10, 10—15, and 15—25.

(*c.*) It is shown that the series chosen is the only one which realises this ideal.

(2.) A discussion of the reasons for making interpolations in u_x values of population and deaths *combined*, instead of dealing with them *separately*.

(3.) Experimental calculations, showing to what extent the p_x and E_x values are affected by taking different numbers of orders of differences in the interpolations.

(4.) A comparison of the results to be obtained from the same data by the "analytical" and "graphic" methods respectively, illustrated by a Life-Table worked out from the data of the Brighton Life-Table (males) by the method described in Section I.

IV.—*Practical Uses of Life-Tables.*

Having already, I fear, considerably exceeded the time and space available for this paper in describing the *construction* of Life-Tables, it will not be possible to do more than indicate in the briefest possible manner their *practical uses*, which indeed might well demand a whole paper to be at all adequately dealt with.

The use of Life-Tables in forming the basis of calculations relating to problems connected with life assurance and annuities need only be alluded to.

From the point of view of public health, the uses of a Life-Table when it has been prepared for any district may be thus summarised :—

(1.) It is possible to make exact comparisons—

(*a.*) On the one hand with the whole country, say England and Wales, and on the other, with the Selected Healthy Districts.

(*b.*) With all other districts (for the same decennial age period) for which Life-Tables have been prepared.

(*c.*) And, what is of very special importance, with succeeding Life-Tables for the *same* district, thus obtaining in the most exact way possible indications of progress or the reverse in the conditions which favour health and length of life.

The special lines along which such comparisons may be made may be thus briefly pointed out—

(*a.*) *The p_x Values.*

These afford the means of testing the vitality of a community for each special age or age-period, depending as they do neither upon any conditions coming before, nor upon any following after, but simply upon the force of mortality or death-rate which has prevailed at the special age-period under consideration.

Still, except for the first five years of life, such comparison is perhaps most usually and most readily made by comparing the death-rates as ordinarily worked out for the separate age-groups.

(*b.*) *The l_x Values.*

These depend upon *antecedent*[3] conditions, that is, upon the preceding rates of mortality. Thus high death-rates during the earlier years of life make the l_x values less at all after ages.

It must be noted too that l_x numbers can only be fairly compared between Extended Life-Tables, or between Short Life-Tables worked out by the same methods. It is fallacious to compare the l_x numbers of a Short Life-Table, especially at the later ages, with the corresponding numbers of an Extended Life-Table.

(*c.*) *The E_x Values.*

These are affected solely by *following*, and not by preceding conditions, depending as they do upon the death-rates for the after age periods.

For one may start the calculation of E_x values from the p_x values with any number or "radix," and of course obtain just the same results for after ages.

(*d.*) There is another, and, perhaps, the most important use

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[3] The terms "antecedent" and "subsequent" are of course only used in a hypothetical sense. In a Life-Table calculated from the data for any decennial period, the actual death-rates at the different age-periods are *simultaneous*. They are assumed, however, to exist in succession as applied to the generation whose life-history is being traced.

of a life-table, which was first pointed out in the " Report on the " Health of Greater Manchester " for the years 1891-93, published by Dr. Tatham in 1894. This is associated with all the ideas connoted by the term " life-capital."

For a complete explanation and description of these ideas, reference may be made to the original report just mentioned. The following is only a brief allusion. An Extended Life-Table for males and females having been constructed for a decennial period, say 1881-90, the assumption has to be made that the age and sex distribution of its population, and the death-rates for its separate age groups remain the same during the succeeding ten years.

Having now the values expressing the expectation of life at birth for males and females, it is obvious that multiplying them by the numbers of births of males and females in any year will give the number of prospective years of life added in the year to the life capital of the community.

Since the same number which gives the estimated mean population for any year, expresses also the number of years of life lived or expended by the community in that year, the balance of loss or gain of Life-Capital can readily be struck.

The Extended Life-Table, however, gives not only the expectation of life at birth, but the mean after lifetime at each age. Hence if this can be calculated from the life-table in *groups of years*, corresponding to those usually employed in classifying deaths, the same method which has been applied to births may be applied to the estimated living population in calculating life capital.

The future lifetime of P_x persons, that is of P persons living at all ages from x to $x + 1$, must be from the Life-Table equal to $Q_x - \dfrac{P_x}{2}$, on the assumption which is made in Life-Table construction, that the average age of the P_x persons is $x + \frac{1}{2}$ at the middle of the year. At the middle of the year they will therefore have each lived half the year on the average, and therefore $\dfrac{P_x}{2}$ must be deducted from the Q_x value.

It is therefore obvious that their mean expectation of life individually $= \dfrac{Q_x - \frac{1}{2}P_x}{P_x} = \dfrac{Q_x}{P_x} - \frac{1}{2}$.

Similarly the future lifetime of $P_x + P_{x+1} + \ldots . P_{x+n-1}$ persons living at all ages between x and $x + n$ is—

$$(Q_x + Q_{x+1} + \ldots . Q_{x+n-1}) - \tfrac{1}{2}(P_x + P_{x+1} + \ldots . P_{x+n-1}),$$

and their mean expectation of life—

$$= \frac{Q_x + Q_{x+1} + \ldots . Q_{x+n-1})}{P_x + P_{x+1} + \ldots . P_{x+n-1})} - \tfrac{1}{2}.$$

In actual practice of course $n = 5$ or 10.

If the mean values worked out by this method are applied to the estimated population for any year, proportionately distributed in age and sex groups, the aggregate *life-capital* of the community is arrived at.[4]

Then $\dfrac{\text{life-capital}}{\text{population}}$ = average life-capital or future lifetime of each individual of the population ;

and since the mean population = years of life expended in the year, $\dfrac{\text{population}}{\text{life-capital}} \times 100$ = proportion per cent. of life-capital expended in the year.

Finally, if a calculation be made of the number of deaths which *should have occurred* in each age group, if the mean death-rates for the ten-yearly period of the Life-Table had continued unchanged, and then a comparison be made between these numbers and the numbers of deaths which *have actually occurred* in the year being dealt with, it is a simple matter to strike the balance of gain or loss of life-capital. It is obvious also that the earlier in life the loss or gain is found to have occurred the greater will be the loss or gain of life-capital.

Such is a brief and bald statement, which can have no claim or pretention to originality, of the principal ways in which a Life-Table can be practically applied.

Before however a Life-Table can be used, it has to be *constructed*, and if this paper should make easier for others the path which I have found very difficult to find and to follow, the labour expended will have its more than sufficient reward.

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[4] The Life-capital method assumes that the age-distribution of the *actual* population *within each age-group* is the same as the age-distribution of the Life-Table within the corresponding age-group. The error of this assumption is probably unimportant.

Discussion *on* Mr. Hayward's Paper.

Mr. A. H. Bailey, F.I.A., was satisfied that an immense amount of pains and trouble had been bestowed upon a subject which was not often, as on the present occasion, touched upon by a medical officer of health. He called attention to the fact as regards the construction of tables of mortality, that the materials available were not always the same. If one had to determine the mortality of a particular society, a friendly society or an assurance society, there was available the whole record of the individuals and the precise dates of birth and death. But in the investigations to which Mr. Hayward had been referring, the circumstances were not precisely the same. One had to take the numbers living and the number of deaths in particular localities, but they were not the deaths necessarily of the same people. The difficulty which arose was due to emigration and immigration. It was impossible to discuss a paper like the present at that meeting. The question of interpolation was one of considerable difficulty. They had often tried to arrive at the theoretical law of mortality. A suggestion was made, and it was borne out by some of the facts, that the rate of mortality from 15 to 55 increased in the geometrical progression of 3 per cent. per annum, and after 55 there was a sudden increase of 8 per cent. to the end of life. That was not actually borne out, but if they examined tables of mortality there seemed to be some foundation for it. If that was so it would simplify the principle of interpolation which was proposed here. There must be considerable difficulty in arriving at the rates of mortality in particular districts in a country like England, where the changes of the character which he had indicated were very considerable. In conclusion he expressed his great pleasure at listening to such an interesting paper.

Mr. N. A. Humphreys said the reader of the paper having mentioned his name in a far too flattering manner in connection with that of their eminent past President, Dr. William Farr, he wished to explain that he did not pretend to be an expert on Life-Tables, but was glad to have been able to devote a great deal of time and work during a long series of years to the promotion of improved methods for dealing with vital statistics, especially mortality statistics, and of their correct interpretation. The Life-Table method was the only one which gave approximately accurate means of comparing the mortality statistics of different communities and different countries. He had been struck with the industry and ability displayed by Mr. Hayward in the valuable experiments which he had made, and had been much interested in the satisfactory results derived from those experiments. The paper would be pre-eminently useful hereafter, and the subject

appeared to him an entirely suitable one to bring before that
Society. The experiments which Mr. Hayward had previously
made on a very small population had led him to study the subject
on a larger basis, and had resulted in an undoubtedly valuable
paper; but it was as well to suggest caution against the doubtful
results of the serious labour involved in calculating Life-Tables
from the statistics of small populations. Referring to Mr. Bailey's
point as to the disturbing influence of migration, he admitted that
the Life-Table of a town was obviously affected by the fact that
the population between 15 and 35 was very largely recruited by
healthy immigrants from country districts, who come into towns
as shop assistants, mechanics, domestic servants, &c. When these
people fall ill they to a very large extent return to their country
districts and often die there. The town therefore had the credit
and advantage of these vigorous young immigrants during their
residence therein, and the country districts were somewhat unjustly
debited with their mortality. The rate of mortality between those
ages in the country often indeed appeared to be in excess of that
in towns, which was obviously untrue. Great caution therefore
should be observed in devoting a great deal of time and labour to
the construction of Life-Tables for small local populations, which
were specially subject to these disturbing influences. Even the
healthy district Life-Table, which was constructed by Dr. Farr,
was open to some objection on the same ground. It overstated
the true mortality of residents in the healthy districts, from the
fact that the table included the deaths of considerable numbers
of town immigrants who returned to these districts on account of
health failure due to town residence. There was unfortunately no
available method by which the true rate of mortality for country
districts could be calculated by eliminating these cases. Whether
they dealt with the recorded rates of mortality or with Life-Table
calculations, the mortality in towns was inevitably understated,
and in country districts it was overstated. These disturbing
influences did not affect Life-Tables for the whole country, and it
had been the rule in the Registrar-General's office for some time
past to calculate and publish a new English Life-Table based upon
the mortality statistics of each intercensal period of ten years.
The materials from which local Life-Tables had to be constructed
were more or less unsatisfactory and subject to the disturbing
influences already alluded to. Census returns, it is moreover
true, did not give entirely accurate facts as to age, especially in
the first few years of life; but he had good reason to know that
each succeeding census had given facts of increasing accuracy, and
therefore he should not discourage the construction of Life-Tables
based on such statistics, but would rather suggest that censuses
should be taken at more frequent intervals. It was to be hoped
that the Census Act of next session would give the necessary
authority for a quinquennial enumeration. He concluded by
saying that there was one point which always puzzled him in
dealing with this subject of Life-Tables, and he hoped the author
would be able to throw some light upon it. There was a period
of life from 10 to 25 at which the recorded death-rate for the

whole of England and Wales was almost invariably below the rate of mortality shown by the Life-Table method. Was there, he asked, some flaw in the figures upon which these calculations were based, or was the method of dealing with them at fault? Before sitting down, he might again repeat that the Society was under a great obligation to Mr. Hayward for the unstinted labour which he had devoted to this important subject.

Mr. PRICE-WILLIAMS said that the paper contained a great mass of very interesting statistics, and he regretted the absence of some of our leading actuaries, who would be most capable of appreciating the value of the paper. He had been greatly impressed with the admirable way in which the hand-sized diagrams which accompanied the paper had been prepared, and how strikingly they illustrated (in a manner which no mere array of figures in tabular statements could have done) the chief points and conclusions to which the author had drawn attention. He hoped in future that in addition to the hand-sized diagrams, large diagrams to a befitting scale might be exhibited on the walls to enable members more readily to follow the description and to realise the conclusions given in the paper.

Mr. C. H. E. REA expressed his sincere appreciation of the great labour which the author had bestowed upon an important subject, and he believed that good might come from some of the suggestions put forward. With regard to the author's introductory statement, that "but few of the Fellows of the Society, except those connected with the departments of public health or official statistical work, would ever be likely to actually engage in the work of practically attempting the construction of a Life-Table," he thought that was a matter upon which they need not feel much regret. In spite of what the author had said as to his desire to address the medical rather than the actuarial profession, the paper, he thought, was more actuarial than medical, and he doubted very much whether the members of the medical profession would find it possible to extend their labours and studies so far out of their distinct province, as to follow the formulæ and methods which the author had advanced for them to carry out in forming the Life-Tables suggested; and then there was the danger that those who did venture thus far might become so fascinated with a glimpse at the higher mathematics as to neglect the requirements of those bodily and physically distressed. And, after all, local Life-Tables, formed on scanty statistics, constantly disturbed moreover by the effects of invalidings and migrations, could never be regarded in themselves as of any particular value. He ventured to think that the author was somewhat modest when he disclaimed being anything of a mathematician, for, judging from the present perusal, the paper seemed to practically treat on the subject of finite differences, with an example in point of Lagrange's formula for interpolation applied to a special case. There is also reference to the formation of the l_x and other depending columns. After pointing out a slight

clerical defect in one of the mathematical expressions, he concluded by expressing an opinion that the medical profession might furnish important and valuable statistics from the various localities under special view, but he deprecated any attempt being made on their part to operate actuarially on the bare facts ; it seemed to him very much like placing a stethoscope in the hands of an actuary with a full written description of the end that had to be placed to the ear. Such departures would be highly dangerous, and could only tend to interfere with the present satisfactory condition of our mortality tables and disturb that l_x column, the construction and meaning of which is ably explained by the author. In other respects the paper presented features of interest.

Mr. T. E. HAYWARD said that anyone venturing to present a paper before such a Society as that addressed, must of necessity be prepared to face the ordeal of criticism. In the main he had to be exceedingly grateful to those who had said such very kind things in regard to his paper, and he was equally grateful to those who had been good enough to point out what might be considered errors. Had time been permitted beforehand for the Fellows present to thoroughly master the paper, he had no doubt it would have been possible to bring forward still more searching criticisms. He was really quite sincere in what he said, namely, that he had not much mathematical knowledge. Literally he believed that what he had put down in the paper could be done by anyone with simply the use of logarithms and some patience in applying the ordinary rules of arithmetic. His primary object had been to show that by the use of a modified short method, results were to be obtained so very closely approximating to those that would be obtained by undertaking the labour of calculating a complete or "extended" Life-Table, as to render unnecessary for merely local Life-Tables the more laborious method. He could only show the closeness of approximation by working out an example and applying the most rigidly exact modes of calculation that could be used ; and he trusted he had done this with some success. He had shown that the results by the short method could be obtained in a fraction of the time required for the extended Life-Table. If the short method which he had explained were used, the results were quickly arrived at, and they were quite near enough to those which would be obtained by the longer method, to enable them to be used with a sufficient degree of confidence. He fully recognised the difficulties with regard to the absence of data as to emigration and immigration. With regard to the comparison of the actual death-rates with Life-Table results, he could only suggest that discrepancies might have something to do with the different methods of interpolation adopted for the age-period 5 to 25. He was greatly indebted for what Mr. Price-Williams had said with regard to the diagrams ; and for his own part he should like to have shown them on a larger scale. He had no wish to confound the actuarial and medical professions. What he had advanced did not apply to the medical profession generally,

but merely to medical officers of health, who had to be, to some extent, statisticians. The work involved in the preparation of the paper had been considerable, but it was only subsidiary to his medical work, and he had taken it up to some extent as a recreation, and he hoped the results might not be without some practical use.

The CHAIRMAN (Major P. G. CRAIGIE) said it was his pleasing duty to move a very cordial vote of thanks to Mr. Hayward for his kindness in preparing the matter which he had laid before the Society that evening. He should not for a moment attempt to enter into any discussion upon a technical paper such as this, but he should like to say, as a very old officer of the Society, that he maintained that it was well within the scope of their functions to receive and consider papers of this nature dealing with the methods of recording and tabulating data, as well as papers of a more attractive and popular kind, representing economic deductions from published facts. The Royal Statistical Society, as a scientific body, were discharging an important duty in endeavouring to obtain and give publicity to the best possible lights on the sufficiency of the various methods of compiling Life-Tables. They had had that evening put before them certain suggestions for producing results which might prove of great value to those who were daily engaged in such work as that of the reader of the paper. He was particularly struck by what Mr. Hayward said, that a medical officer of health, who was every year becoming a factor of increasing force and influence in the social concern of life, ought to be trained to treat the data he had to handle from a broad and correctly statistical point of view. He felt sure that those present would not end their study of the paper in that room, but that they would afterwards carefully peruse it in the *Journal*, where the suggestions made by Mr. Hayward would find a wider and an attentive circle of students.

The Flag *and* Trade: *a* Summary Review *of the* Trade *of the* Chief Colonial Empires. *By* A. W. Flux, M.A.

The manufacturing populations of Western Europe and of the United States of America are becoming increasingly conscious of the extent to which the continued development of their industries, on the present lines, involves a search for new markets for their products. This desire for new markets has influenced the trend of politics, and is not the least of the motives which lie behind the policy of imperial expansion. Districts in which the need for the products of modern machine-industry has not hitherto been felt must be brought under the influence of some civilised power, so that their inhabitants may become purchasers of goods for which merchants cannot easily find customers elsewhere.

It is possible that the interposition of an outside authority, armed with the best of modern weapons of war, may relieve savage populations from many evils from which they suffer. Inter-tribal warfare, slavery, disease, restrain the development of the resources of these countries. Good government can easily lead to such increase of wealth and population as to convert savage tribes into good customers for the manufactures of Lancashire or Fall River or other busy industrial centres. If such markets for standard lines of products can be secured, expansion of production on lines similar to those which long experience has already smoothed may present a prospect of profit. Without such extension of demand the increase of producing power threatens a competition which will ruinously reduce profits. The avoidance of such cut-throat competition is difficult. If new buyers for old classes of products cannot be found, a refuge is to find buyers of new products, to exploit a demand as yet unknown, and in regard to which it cannot be certain that it may not even be found non-existent. That way lies risk which it takes a man of somewhat exceptional qualities to face. Some even refuse to admit that there is a possibility of utilising productive energy in that way. They know that a little veneer of civilisation will convert the African into a user of certain well-known goods, that the influence of western habits will arouse a desire in the Chinaman for western commodities, but they doubt the existence of undeveloped possibilities in their fellow countrymen—possibilities of becoming capable of offering an equivalent in exchange for satisfactions as yet untasted. The evocation of a greater producing power in response

to new satisfactions, if possible, requires that the appropriate attractions should be discovered, and that means of supplying them with profit should also be discovered. It is much more to the point—more practical—or appears so, to urge on the extension of markets for well known goods, so long as large areas of the earth's surface are not brought under the influence of civilisation. Our descendants may be left to solve the problems which the complete exploitation of all existing virgin markets will bring with it—just as our descendants are left the problem of maintaining the position of our country when the exhaustion of our best supplies of coal have sacrificed so much of our supremacy as depends on having the best coal supplies.

The demand for new markets needs no extended explanation, it is an obvious fact. Together with this demand comes the desire to control the new markets in the interest of the producers of some particular nation. The prevalent exclusion of foreigners, by discriminating customs duties, from the benefits of exploiting new markets in a colony or dependency, is at once a means of reserving trade for a particular group of merchants and a stimulus to others, belonging to other nations, to demand the control of any unoccupied portions of the earth's surface, so as to prevent them from falling under an influence which may prove exclusive in its operation. Even if the " open door " be maintained in any particular case, there is a widespread confidence that " trade " follows the flag," and hence a desire that the flag which proclaims the controlling power may be that of the country of which one is oneself a citizen, if one be a trader or in sympathy with the trading classes. The object of this paper is to illustrate, so far as the details available to the writer permit, the extent to which trade has actually grown up under the flag. The relative importance of the trade of each of the chief colony-owning countries with its colonies and with other countries will be considered on the one hand, and the relative importance in the trade of the colonies of that section of the trade which is carried on with the sovereign State on the other. In making these comparisons, some of the countries included in the list of " Colonial Systems of the World " given in the " Monthly " Summary of Commerce and Finance of the United States " for December last, may be omitted. Austria-Hungary, Russia, Turkey, and China will not be profitably included in such an inquiry as I propose, neither will Italy afford information of any considerable value. The United States is, except in regard to its ownership of Hawaii, too recently in possession of a colonial empire for the history of its colonial trade to be regarded from the same point of view as that of other countries. Something

will have to be said of its trade with colonies of other powers, but that is a different matter. The German colonial empire is also of so recent acquisition that it will not contribute much of value to the comparative statistics sought. Denmark's colonies are small in extent, and in situation peculiar, from the point of view of trade, and, though included in the inquiry, do not afford a very important section of the material. There remain then as subjects of inquiry and comparison the colonial empires of Spain (to be considered as it was before the recent war), Portugal, Holland, France, and Britain [a term which I shall crave leave to use in place of the more cumbrous expression—the United Kingdom of Great Britain and Ireland].

The first side of the comparison will occupy no great space or time; a summary statement is sufficient. It shows the average amount of the import and export trade of each of the countries concerned in the two quinquennia 1887-91 and 1892-96; the figures for 1897 not being available as yet for all the countries, the latest date of comparison is more remote than one could wish. The imports and exports to colonies and dependencies are stated for comparison with the total.

Total Trade compared with Colonial Trade.   Annual Average, 1892-96.
[000's omitted in amount columns.]

Country.	1 Total Imports.*	2 Imports from Possessions.	2 as a Percentage of 1.	4 Total Exports.† (Special.)	5 Exports to Possessions.	5 as Percentage of 4.
	£	£		£	£	
Britain	419,065,	94,437,	22·50	225,551,	74,804,	33·20
France	155,285,	14,725,	9·50	132,399,	12,607,	9·50
Holland	120,542,	17,433,	14·50	98,014,	4,945,	5·00
Portugal............	10,861,	1,714,	15·80	5,628,	517,	9·20
Spain	31,609,	3,078,	9·70	29,831,	7,166,	24·00
Denmark	19,353,	221,	1·10	14,487,	232,	1·60
Germany	203,464,	110,	0·05	158,506,	146,	0·09

Annual Average, 1887-91.

Country.	Total Imports.*	Imports from Possessions.	Percentage of Colonial Imports.	Total Exports. (Special.)	Exports to Possessions.	Percentage of Colonial Trade.
	£	£		£	£	
Britain	406,727,	92,721,	22·8	243,230,	83,243,	34·2
France...............	173,235,	13,184,	7·6	140,162,	10,803,	7·7
Holland	105,170,	12,844,	12·2	90,475,	4,842,	5·3
Portugal............	11,033,	959,	8·7	4,992,	224,	4·5
Spain‡...............	34,828,	3,117,	9·0	34,017,	4,419,	13·0
Denmark............	16,345,	194,	1·2	11,799,	220,	1·9

  * *Special* imports into France, Holland, and Germany. Total imports in other cases. Bullion and specie not included.
  † Total exports from Spain. Bullion and specie excluded in all cases.
  ‡ Total trade, including bullion and specie.

This table shows some important contrasts, and marks some changes which call for attention. Detailed tables (see Appendix) show that nearly two-thirds of the French trade with French possessions is accounted for by the trade with Algeria and Tunis; that the Dutch colonial trade is mainly with the East Indian possessions, a well-known fact; that the growth in Portuguese colonial trade is mainly with Angola, and in a secondary degree with S. Thomé and Principe; and that the Spanish figures are dominated by the Cuban trade, which was rendered abnormal by the disturbances in that unhappy island. Even the earlier quinquennium does not get quite clear of these disturbances. The movements of specie were quite abnormal in the final years to which the figures relate, and the exclusion of these movements was effected in order to avoid, so far as might be, these exceptional movements.

Summing the figures in the above tables for the four countries which alone, besides our own, show any considerable proportion of colonial trade, namely, France, Holland, Spain, and Portugal, we find the following result :—

[000's omitted.]

From or To	Imports.		Exports.	
	1887-91.	1892-96.	1887-91.	1892-96.
Possessions	£ 30,104,	£ 36,950,	£ 20,288,	£ 25,235,
All countries	324,266,	318,297,	269,646,	265,872,
Percentage colonial	9·3	11·6	7·5	9·5

In spite of a growth of some 20 per cent. in both imports from and exports to the colonies of these four nations, and of a slight fall in the totals of their imports and exports, as against a quite small increase in imports from, and a noteworthy decrease of exports to, British colonies as shown in these tables, the contrast in the importance of colonial trade to Britain and to other countries is most striking.

The figures of trade may be viewed in connection with a statement of areas and populations compiled from official sources as far as possible.

Date.	Country.	Area (Square Miles).	Population.	Area of Colonial Empire (Square Miles).	Population of Colonial Empire.
1895 {	Britain ("Colonial Office List," 1897) .... }	121,562	39,465,720	11,090,490	325,088,320
'93*{	France ("Annuaire Statistique," 1895-96) .... }	204,146	38,517,975	1,195,702	36,151,322
'96 {	Holland ("Annuaire Statistique," 1896) .... }	12,560	5,004,204	785,884	34,489,024
'96†	Portugal	34,336	4,660,095	834,541	7,917,456
'96....	Spain	194,744	18,217,538	323,750	8,500,000
'95 {	Denmark ("Statistik Aarbog," 1897) .... }	14,799	2,256,000	41,079	127,184
'95 {	Germany ("Statistisches Jahrbuch," 1898) .... }	208,694	52,279,901	1,026,709	9,800,000

* Algeria and Tunis, 1891; France, 1896.
† Portugal, 1890.

A further analysis of the British empire will be useful for comparative purposes :—

[000's omitted in amount columns.]

	Area (Square Miles).	Population, 1891.	Imports to Britain from thence.		Exports of British and Irish Produce thither.	
			1887-91.	1892-96.	1887-91.	1892-96.
			£	£	£	£
India	1,533,611	303,000,000	32,479,	27,223,	31,828,	28,188,
Self-governing colonies .... }	6,991,713	12,125,090	44,579,	50,477,	38,372,	34,232,
Other colonies and protectorates .... }	2,565,166	9,963,230	15,663,	16,737,	13,043,	12,384,
Total............	11,090,490	325,088,320	92,721,	94,437,	83,243,	74,804,

The contrast, both in area and in population, of the British and other colonial empires, and of the extent of the trade between metropolitan States and dependencies, is a good deal modified by this more precise location of the larger portions of area, of population, and of trade.

The main object of this paper, however, is to gather together information relating to the importance of the trade with the metropolitan State to the dependency rather than to the governing State. To the consideration of this we must presently proceed, but there are two points on which a passing remark appears first desirable. The first is, the extent to which the metropolitan State serves as a centre of distribution for colonial products. In the case of Britain this undoubtedly takes place to a very large extent,

and some of the items of foreign and colonial produce re-exported bear witness to the importance of this trade. The most striking example is wool, with a valuation in the re-export returns of over 14,000,000*l.* out of a total re-export of under 60,000,000*l.* on the average of the years 1892-96. I am not aware, however, of any means of determining the total extent of this description of trade. We can determine the amount of the corresponding trade carried on by Portugal, whose trade returns record a re-export of colonial goods to the value of 1,318,500*l.* in 1896 out of a total value re-exported only amounting to 1,839,000*l.* The average of the five years 1892-96 is 1,458,000*l.* out of 2,573,000*l.* The excess of value of goods arriving in France from her colonies and possessions over the value of colonial goods taken for consumption in 1897 was only 873,000*l.* ; the difference between the total general and special imports into France in that year was 47,260,000*l.* ; it would hence appear that the colonies contribute very little indeed to the transit and *entrepôt* trade of France.

Viewed from the other side, the exports to British colonies of non-British goods are given at over 6,500,000*l.* in 1896, a figure exceeding by about 300,000*l.* the average of the quinquennium ending at that date. From Portugal the foreign goods exported to colonies in 1896 are stated at 348,700*l.*, and for the quinquennium 1892-96 they average 508,500*l.* ; an amount not far short of the value of Portuguese goods exported to colonies of Portugal, and an amount approximately equal to the similar figure for the preceding quinquennium, when the Portuguese goods exported to colonies of Portugal were of much smaller value. The general exports from France to her colonies and possessions exceeded the special exports (*i.e.*, of French or naturalised goods) by 3,465,850*l.*, or nearly one-fourth the value of French goods exported to her possessions by France in 1897. According to a writer in the " Depêche Coloniale," quoted in the " Board of Trade " Journal " for October last, a value of 1,061,900*l.* of these exports of foreign goods from France to French possessions consisted of cotton tissues, and a writer in the " Manchester Guardian " of about the same date shows reason for supposing that considerable quantities of English prints were exported to French possessions in this way. Whether this writer's further suggestion, that these prints are sold as French when they reach their destination, be justified or not, the fact of a large export of foreign goods from France itself to French colonies is a noteworthy one.

Trade of the British Empire with Britain.

We will now turn to the main theme of the paper, and begin by a consideration of the recorded imports from and exports to

Britain in comparison with the total foreign trade of British colonies. As our colonial trade has been recently discussed by this Society, a summary statement will suffice.

Trade of the Empire with Britain. Annual Average, 1892-96.

[000's omitted in amount columns.]

Possession or Group of Possessions.	Total Imports.	Imports from Britain.	Percentage of British Imports.	Total Exports.	Exports to Britain.	Percentage of Exports to Britain.
	£	£		£	£	
India	52,577,	37,811,	71·9	68,250,	22,656,	33·2
Australia	25,699,	18,243,	71·0	33,238,	22,831,	68·7
New Zealand	6,836,	4,381,	64·1	9,125,	7,402,	81·1
Canada	23,327,	7,697,	33·0	24,029,	13,200,	54·9
Newfoundland*	1,383,	444,	32·1	1,295,	318,	24·6
Cape of Good Hope	14,113,	11,075,	78·5	14,610,	14,088,	96·4
Natal	3,214,	2,293,	71·3	1,231,	875,	71·1
West India Islands	6,587,	2,903,	44·1	5,948,	1,613,	27·1
,, Africa	2,881,	2,107,	73·1	3,060,	1,621,	53·0
Straits Settlements	21,021,	2,703,	12·9	18,562,	3,344,	18·0
Ceylon	4,629,	1,153,	24·9	4,237,	2,999,	70·8
Mauritius	1,981,	443,	22·4	1,681,	122,	7·3
British Guiana	1,631,	890,	54·6	2,100,	1,142,	54·4
Other†	1,105,	244,	22·1	1,038,	146,	14·1
Total	166,984,	92,387,	55·3	188,404,	92,357,	49·0

  * Average of 1893-96.

  † Viz., Labuan, British New Guinea, Fiji, Falkland Islands, St. Helena, Bermuda, and Honduras.

In preparing this table, the Indian trade-figures, which represent only the sea-borne trade, have been converted into sterling for each year at the average rate of Council bills, and the same for Mauritius. In dealing with Australia, the inter-colonial trade between the six Australian colonies, amounting to some 22,500,000*l.* each way, has been omitted in compiling the total, so as to obtain a representation corresponding to a federated Australia.

There are a few of the minor possessions of Great Britain whose trade is not included in the above table, and there are necessarily excluded, for want of sufficient information, the trade of Gibraltar, Malta, and Hong Kong. The exports to these three together averaged 3,410,000*l.* in the period in question, and the imports from them averaged 910,000*l.*

In looking down the table, the high percentage of trade with Britain is noteworthy. The first exception to the general high percentage is Canada, whose import trade is larger with the United States than with the mother country. The next is

Newfoundland, importing more largely from Canada than from Britain, and nearly as extensively from the United States as from the mother country. On the export side the trade of Newfoundland is more widely spread. Great Britain comes first, but Brazil and Portugal as well as Canada and the United States share largely in this trade, for obvious reasons, when the nature of the chief export is considered. Next comes the West Indies, for some of the principal productions of which the neighbouring United States market is more favourably situated than the comparatively distant British market. More striking by far, perhaps the most striking case in the list at a first glance, is the position of the Straits Settlements. We have only to remember how large a part in this case is played by the *entrepôt* trade to have a full explanation of the situation. Ceylon and Mauritius do their chief trade with India and Australia (and the Cape of Good Hope in the case of Mauritius), and thus the small proportion done with Britain indicates no large current of extra-imperial trade. The same kind of explanation applies to the miscellaneous group. Fiji, for example, does the bulk of its trade with Australia, and taken altogether, here again trade with other colonies is greater in amount than with the mother country. In fact, taking the whole list in the table, besides the inter-Australian trade already referred to, there is recorded fully 22,750,000*l.* per annum on the import side, and 24,350,000*l.* on the export side of the trade from or to other portions of the empire than Britain itself. These amounts bring up the percentage of imports from other parts of the empire to 69, and of exports to other parts of the empire to 62, or, on the whole trade, over 65 per cent. A rearrangement, or rather a partial grouping, of the figures in the last table corresponding to the grouping of the preceding table, may be of service. We obtain the following :—

The Preceding Table Re-stated.

[000's omitted in amount columns.]

	Total Imports.	Imports from Britain.	Percentage of British Imports.	Total Exports.	Exports to Britain.	Percentage of Exports to Britain.
	£	£		£	£	
India	52,577,	37,811,	71·9	68,250,	22,656,	33·2
Self - governing colonies	74,572,	44,133,	59·2	83,528,	58,714,	70·3
Other colonies	39,835,	10,443,	26·2	36,626,	10,987,	29·3
Of which Straits Settlements	21,021,	2,703,	12·9	18,562,	3,344,	18·0
The remainder	18,814,	7,740,	41·1	18,064,	7,643,	42·3

In comparing the figures of this table with the previously given summary of the British record of trade with colonies, it must be remembered that the present table is not so exhaustive as the British record in the section which includes the miscellaneous lesser colonial markets. A striking discrepancy in the two sets of figures is the recorded export from self-governing colonies to Britain of 58,714,000*l.* per annum on the five-year average, while the recorded receipt of imports from self-governing colonies amounts to but 50,477,000*l.* The latter figure, however, does not include gold, which is included in the former.[1]

The changes in a quarter of a century may be seen by comparing the tables just given with similar statements for a quarter of a century previous, which now follow :—

Trade of the Empire with Britain. Annual Average, 1867-71.

[000's omitted in amount columns.]

Possession or Group of Possessions.	Total Imports.	Imports from Britain.	Percentage of British Imports.	Total Exports.	Exports to Britain.	Percentage of Exports to Britain.
	£	£		£	£	
India	45,818,	31,707,	69·2	56,532,	29,738,	52·6
Australia......	17,639,	11,353,	64·4	20,104,	14,156,	70·4
New Zealand	4,805,	2,406,	50·0	4,681,	2,280,	48·7
Canada	16,237,	8,102,	49·9	13,414,	4,214,	31·4
Newfoundland	1,159,	444,	38·3	1,165,	386,	33·1
Cape of Good Hope	2,398,	1,889,	78·8	2,661,	2,200,	82·7
Natal	374,	308,	82·4	361,	240,	66·6
West Indian islands	4,486,	2,003,	44·7	4,954,	3,626,	73·2
„ Africa	1,004,	696,	69·3	1,324,	599,	45·2
Straits Settlements...	8,712,	2,324,	26·7	7,780,	1,514,	19·5
Ceylon.........................	4,595,	1,357,	29·6	3,777,	2,709,	71·7
Mauritius	2,001,	468,	23·4	2,440,	737,	30·2
British Guiana	1,697,	870,	51·3	2,379,	1,390,	58·4
Other	666,	237,	35·6	397,	123,	31·0
Total................	111,591,	64,164,	57·5	121,969,	63,912,	52·4

Comparing this table with that for 1892-96, the broadest contrasts are to be found in the larger proportion of the exports of the West Indies and of Mauritius, which formerly sought the British market, the smaller exports to this country from India, and the approximate reversal of the proportions of import and export trade done by Canada with Britain.

Summarising in the same manner as before, and using the

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[1] The recorded imports into Britain of gold and silver bullion and specie from Australasia, British South Africa, and British North America, averaged 11,327,000*l.* in 1892-96. If to this the value of diamonds imported from South Africa, nearly 4,000,000*l.* per annum, be added, the agreement between the two accounts is satisfactory.

term self-governing Colonies to indicate those which *now* fall
under that description, whether they did so at the time referred
to or not, we get as the result :—

Trade of 1867-71.

[000's omitted in amount columns.]

	Total Imports.	Imports from Britain.	Per-centage of British Imports.	Total Exports.	Exports to Britain.	Per-centage of Exports to Britain.
	£	£		£	£	
India	45,818,	31,707,	69·2	56,532,	29,738,	52·6
Self - governing colonies	42,612,	24,502,	57·5	42,386,	23,476,	55·4
Other colonies	23,161,	7,955,	34·3	23,051,	10,698,	46·4
Of which Straits Settlements	8,712,	2,324,	26·7	7,780,	1,514,	19·5
The remainder............	14,449,	5,631,	39·0	15,271,	9,184,	60·1

The great source of the growth of Britain's colonial trade is
very clearly shown to be the growth of trade with the colonies to
which self-government has been granted. Their foreign trade has
nearly doubled, and the proportion of it which is carried on with
the mother country has increased from about 56½ per cent. to
65 per cent. In spite of the fact that the growth of India's trade
has been mainly with other countries so far as the exports are
concerned, the value sent to Britain having even considerably
decreased, and that the sugar-growing colonies have also decreased
their exports to Britain, the growth of the trade of the self-
governing colonies has maintained almost at its old figure the
proportion of trade done by the colonies as a whole with Britain.
It has only fallen from 55 to 52 per cent., while the value of the
trade has increased by one-half. As to the trade between the
colonies, the Australian inter-colonial trade, which we have stated
at 22,500,000*l.* for 1892-96, was only between 7,000,000*l.* and
8,000,000*l.* at the earlier date here considered. Other inter-
colonial trade has hardly grown in value. It was recorded at about
20,000,000*l.* on the import side and 25,000,000*l.* on the export side
during the years 1867-71. Thus nearly 76 per cent. of colonial
imports were then derived from the empire, and about 73 per cent.
of the exports went to the empire, or about 74 per cent. of the
total trade was carried on with other parts of the empire, as com-
pared with the 65 per cent. at the more recent date as recorded
above.

The peculiar nature of the trade of the Straits Settlements,
which has been remarked upon, and the exceptional change in the

export trade of India suggests a comparison of figures omitting these two from the summary. The summaries already given readily afford the following :—

Trade of British Possessions other than India and the Straits Settlements.

[000's omitted in amount columns.]

Annual Average.	Total Imports.	Imports from Britain.	Percentage from Britain.	Total Exports.	Exports to Britain.	Percentage to Britain.
	£	£		£	£	
1867–71........................	57,061,	30,133,	52·8	57,657,	32,660,	56·7
'92–96........................	93,386,	51,873,	55·5	101,592,	66,357,	65·3

The portion of the empire here separately considered shows a more progressive trade, and a trade with the mother country both larger in proportion and increasing more rapidly than is shown by the empire at large. In the twenty-five years' interval the percentage of trade done with Britain has increased from about 55 to over 60. Let us see how other colonial empires compare with our own in this.

French Colonies and their Trade with France.

In presenting a comprehensive view of the trade of French colonies and protectorates, I am, unfortunately, unable to offer a table as uniform in date and representing the same years as that covered by the table relating to British colonies and possessions. I give first a table showing the figures for the year 1896 in most cases, but, as the " Annuaire Statistique de la France " does not supply the figures quite regularly, the figures of 1893 are used for French India and French Guiana, those of 1894 for Annam and St. Pierre and Miquelon, those of 1897 for the French Congo and Tahiti and its dependencies.

Trade of French Possessions in 1896.

[000's omitted in amount columns.]

Colony or Protectorate.	Total Imports.	Imports from France.	Per-centage of French Imports.	Total Exports.	Exports to France.	Per-centage of Exports to France.
	frs.	frs.		frs.	frs.	
Cochin-China and Cambodia, An-nam and Tonkin	85,564,	30,423,	35·6	92,718,	9,510,	10·3
French India	3,277,	532,	16·2	20,129,	12,709,	63·1
Réunion	21,888,	13,160,	60·1	16,918,	16,055,	94·3
Madagascar	13,988,	5,798,	41·4	3,606,	737,	20·4
Tahiti, &c.	3,745,	390,	10·4	3,151,	311,	9·9
New Caledonia	9,193,	4,737,	51·5	5,749,	2,411,	41·9
Senegal	29,180,	16,853,	57·8	21,137,	13,414,	63·5
Congo, Gulf of Guinea, Daho-mey, and Soudan	23,798,	6,531,	27·4	23,950,	7,568,	31·6
French Guiana	10,921,	7,400,	67·8	4,734,	4,387,	92·7
Martinique	22,885,	9,376,	42·0	21,431,	19,726,	92·0
Guadaloupe	21,762,	10,755,	49·4	18,793,	7,107,	37·8
St. Pierre and Miquelon............	6,750,	3,054,	45·2	9,400,	7,091,	75·4
Total	252,951,	109,009,	41·1	241,716,	101,025,	41·8
Tunis	46,445,	25,563,	55·0	34,508,	20,223,	50·9
Algeria	275,799,	217,802,	79·0	240,471,	196,842,	81·9
Final total	575,195,	352,374,	61·2	516,695,	318,090,	61·6

In the compilation of the above table there is more than one feature which is unsatisfactory. In some cases the imports into the colonies are given, not as from France, but as of French goods. In at least one case (Senegal) the details further given show that the resulting totals are not quite the same if the figures of " French " goods be substituted for the figures of imports " from France." While it may be desirable to have the former rather than the latter, the admixture of figures of one class with those of the other is not satisfactory. Further, the figures for Tonkin include imports from other French colonies with those from France. It will be, therefore, well to take the details given in the " Annuaire Statistique " for 1895-96, which permits the further gain of averaging over a series of years, and thus avoiding any misleading conclusions based on exceptional conditions of a single year—should the year selected happen to be exceptional. I am not asserting that this was actually the case with 1896.

Annual Average, 1887-91.

[000's omitted in amount columns.]

	Total Imports.	Imports from France.	Percentage from France.	Total Exports.	Exports to France.	Percentage to France.
	frs.	frs.		frs.	frs.	
Indo-China	67,549,	17,163,	25·4	65,955,	2,538,	3·8
India	7,301,	2,733,	37·4	21,282,	12,200,	57·3
Mayotte	912,	386,	42·3	1,244,	1,088,	87·5
Nossi-Bé	2,063,	191,	9·3	2,105,	200,	9·5
Ste. Marie de Mada- gascar (1887-89)	315,	151,	47·9	144,	7,	4·9
Réunion	22,771,	9,047,	39·7	15,486,	12,731,	82·2
New Caledonia	9,845,	4,269,	43·4	5,559,	1,115,	20·1
Tahiti	3,607,	726,	20·1	3,391,	130,	3·8
Congo and Gulf of Guinea	4,063,	1,460,	35·9	4,012,	700,	17·4
Senegal (1887, 1890, and 1891)	19,737,	9,059,	45·9	14,006,	10,940,	78·1
Guiana	9,752,	6,300,	64·6	4,941,	4,683,	94·8
Martinique	26,643,	8,885,	33·3	22,812,	21,197,	92·9
Guadaloupe	22,663,	9,692,	42·8	22,117,	21,145,	95·6
Ste. Pierre and Miquelon	13,822,	3,694,	26·0	16,296,	9,843,	60·4
Total	211,043,	73,756,	34·9	199,350,	98,517,	49·4
Tunis, 1892-96	42,032,	22,863,	54·4	35,914,	20,386,	56·8
Algeria, 1892-96	258,956,	198,936,	76·8	249,938,	202,518,	81·0

The figures for Tunis and Algeria are not included in the summaries of colonial trade in the " Annuaire Statistique," and the later quinquennium is given as representing more nearly present conditions, the fact that the returns for Tunis in 1891 include nearly fifteen months' trade, owing to a revision of the beginning of the year of account, introducing a difficulty in the earlier quinquennium. The relations between France and these two dependencies are, further, rather special, and their separation from the main group is desirable on that account. The term Indo-China in the table covers Cochin-China, Annam and Tonkin.

In addition to the trade with France noted in the preceding table, an import to the value of 2,082,000 frs., and an export to the value of 4,162,000 frs. annually, represents trade with other French colonies carried on by the fourteen colonies to which the greater part of the table is devoted.

Taken together, 42 per cent. of the trade of these fourteen colonies is recorded as taking place with the mother country in the quinquennium 1887-91, and altogether 43½ per cent. of the colonial trade was directed to or derived from France or some other colony.

It will not be without interest to make here a comparison with the direction of the trade of the French colonies a generation ago, somewhat as was done for the British colonies. Considered from the point of view of France, the trade with colonies formed then 7·4 per cent. of the special trade, or about as large a proportion as in the quinquennium 1887-91, a quarter of a century afterwards. It should be remarked that in the interval it had fallen to a lower level, being only about 6 per cent. in 1882-86, for example. Another point is that the exports to the colonies formed 8 per cent. of the special exports from France at the beginning of the sixties, while in the early eighties they were less than 7 per cent. The advancing proportion of importance of the colonial trade shown in previous tables is, then, not part of a long continued advance, but a recovery after decline, though to a larger figure than any of those which I offer for comparison.

On the side of the colonies the following table presents, on the same lines as before, the proportion of trade with France :—

Annual Average, 1859-63.*

[000's omitted in amount columns.]

	Total Imports.	Imports from France.	Percentage of Imports from France.	Total Exports.	Exports to France.	Percentage of Exports to France.
	frs.	frs.		frs.	frs.	
Martinique	28,584,	19,788,	69·2	22,820,	20,250,	88·7
Guadaloupe	25,914,	17,282,	66·7	20,408,	18,661,	91·4
Guiana	7,425,	4,828,	65·0	1,320,	1,050,	79·5
Réunion	47,976,	26,774,	55·8	50,144,	47,623,	95·0
Senegal	17,627,	10,552,	59·9	15,370,	11,761,	76·5
Ste. Pierre and Miquelon	3,912,	1,409,	36·0	4,872,	1,269,	26·0
French India	7,788,	604,	7·6	25,741,	14,006,	54·8
Total	139,226,	81,237,	58·3	140,675,	114,620,	81·5
Corresponding total, 1887-91....	122,689,	49,410,	40·3	116,940,	92,739,	79·0
Algeria	182,703,	163,669,	89·6	53,147,	42,411,	79·8

* The values used in this table are *official*, not *real*, values. Hence comparisons with figures of later date must be made with every reserve. The figures for all the colonies except Algeria are obtained from the " Statistical " Tables relating to Foreign Countries." The data for Algeria being there incomplete, the French annual trade returns have been the source for the Algerian figures. It may be noted that the figures which are given in the " Statistical Tables " relating to Algerian trade do not coincide with those given in the French trade returns. They are nearer, on the whole, to the *official* than to the *real* values, but differ markedly from both.

The falling off in the trade of Réunion more than accounts for the whole of the reduction in the totals of imports and of exports shown in this table, and also accounts for the fall of exports to France. But on the other side, that of imports, the reduction of French imports is only accounted for to the extent of about one-half by the falling off in the trade of Réunion. An equal reduction of imports from France, with only a comparatively small reduction of imports generally, is shown by the French West Indies. The produce of these colonies seeks the home market in overwhelming proportions still, but that has not prevented a very marked fall in the reliance on the home market for necessary supplies.

A further point resulting from comparing the figures for the older group of colonies with those for the whole of the colonies, is that the trade of these more recent acquisitions is carried on to a much smaller extent with France than is that of the older possessions. Leaving aside Tunis and Algeria, we see that the older group had in 1887-91 a total import of about 5,000,000*l.* annually, of which about 2,000,000*l.* was from France. The newer acquisitions imported to about 3,500,000*l.* annually, of which 1,000,000*l.* was from France, or about 27½ per cent., as compared with the 40 per cent. for the older group. On the export side, the older colonies exported some 4,700,000*l.* worth of goods annually, of which 3,700,000*l.* went to France. The newer acquisitions exported some 3,300,000*l.* worth of goods annually, of which only 230,000*l.* went to France, or about 6 per cent. only, as against the 79 per cent. from the older group.

The figures of trade with other French colonies were much larger in the earlier than in the later period, in spite of the inclusion of additional colonies or protectorates at that later date. The imports from other colonies averaged 9,939,000 frs. in the quinquennium 1859-63, and the exports to other colonies averaged 8,628,000 frs. annually. The external trade of the colonies at that date was carried on, therefore, to the extent of 70 per cent. with France, and to nearly 77 per cent. with France and French colonies together, as compared with the 42 and 43½ per cent. respectively shown for 1887-91.

Trade of the Dutch Colonies.

In the case of the possessions of the Netherlands, whether in the East or West Indies, the information provided in the " Annuaire Statistique des Pays Bas " does not permit of the compilation of tables precisely on the lines of those given for the French or British colonies. So far as the imports are

concerned, something not far short of such a statement can
however be made as follows :—

Imports into Dutch Colonies.   (*Merchandise only.*)

[000's omitted in amount columns.]

	1892–96.			1887–91.		
	Total Imports.	Imports from Holland.	Per-centage from Holland.	Total Imports.	Imports from Holland.	Per-centage from Holland.
	£	£		£	£	
East Indies, on Go-vernment account	581,	?	—	436,	?	—
On private account—						
Java and Madoura	8,939,	} 3,942,	30·8	7,255,	} 3,742,	33·2
Other E.I. pos-sessions	3,854,			3,984,		
Surinam	462,	255,	55·2	426,	215,	50·5
Curaçao	272,	?	—	288,	?	—

On this table a few remarks must be made. The absence
of a statement of origin of imports into Curaçao, and of any
sufficient statement as to imports into the lesser Dutch West
Indies, makes the table incomplete, quite apart from the doubt as
to the sources of the imports on Government accounts into Java
and Madoura.

It should further be stated that the basis of valuation of
imports into Surinam underwent a change in 1895, which causes
the rate of growth of the trade of that colony to be under-
estimated. But for this change the total import would be shown
as quite close to 500,000*l.*, instead of 462,000*l.*

But a more important point still in regard to the trade of the
East Indies is the fact that a large proportion of the imports are
recorded as from Singapore, as to the ultimate origin of which an
absolute statement would probably be difficult to make. How
important this feature is, appears from the following statement :—

Imports into Dutch East Indies on Private Account.

[000's omitted in amount columns.]

Date.	Percentage from Singapore and Penang.	From Penang.	From Singapore.	From elsewhere than Singapore and Penang.				
				Total.	From Holland.	Per-centage.	From Britain.	Per-centage.
		£	£	£	£		£	
1887–91	39·7	1,207,	3,258,	6,774,	3,742,	55·2	1,492,	22·0
'92–96	39·8	1,160,	3,930,	7,703,	3,942,	51·2	1,847,	24·0

Whether the true proportion of the imports from Holland to the Dutch East Indies be over one-half, or about one-third, is not ascertainable from the figures here supplied, or from any I have as yet found. Judging from records of Dutch trade with the Straits, the lower figure is the nearer. The percentage of the previous table cannot certainly be accepted as a satisfactory indication, apart from the question of imports on Government account. The important position recorded for British trade is sufficiently worth noting to be included in the table. No other single country approaches to the degree of importance of this.

Turning to the export side of the accounts, the record is less complete. On Government account the exports averaged 1,876,000*l.* in the quinquennium 1887-91, and 1,672,000*l.* in 1892-96. On private account, the exports from Java and Madoura rose from an average of 10,026,000*l.* to an average of 11,230,000*l.*, and from other East Indian possessions of the Netherlands the exports rose from 3,995,000*l.* to 4,060,000*l.* Altogether, the exports of merchandise were, on the average of 1887-91, 15,897,000*l.*, and, five years later, amounted to 16,962,000*l.*

The distribution of the exports as a whole among various destinations is not stated. The great bulk of them go to Holland, the one important exception being sugar. The export of this article has grown rapidly during the last decade, the increase being fully 40 per cent. As to the countries to which it goes, America stands first, China second; these two together taking, in 1897, some four-fifths of the total; a total of, roundly, half a million tons. This account of the ultimate destination of the sugar exports, which is derived from information afforded by market reports, differs somewhat from an official table, according to which shipments which are (apparently) assigned to America in the market reports, are recorded as being sent to the Mediterranean, or to the English Channel "for orders."

The export of tea has grown recently about as fast as that of sugar. About three-fifths of the whole was shipped to Holland in 1897, and most of the remainder to England. Indigo is another export of growing importance, of which Holland took some three-quarters of the total in 1897. Some fifteen years ago over one-half the coffee exported was on Government account, derived from the Government plantations; at present only some 30 per cent. of the coffee exported is exported by the Government.

A reference to the trade returns of the Straits Settlements, suggests that a much smaller proportion of the export trade of the Dutch East Indies is carried on with Singapore than occurs in relation to the converse. The exports from the Straits Settlements,

to the Dutch East Indies are given as 3,955,000*l.*, annual average of 1887-91 ; and as 4,133,000*l.* for 1892-96. These figures compare with the 4,465,000*l.*, and 5,090,000*l.* recorded in the imports of the Dutch colonies as from Singapore and Penang. The records of the Straits Settlements' trade show imports from the Dutch colonies in the East Indies at 3,611,000*l.*, annual average of 1887-91, and 3,048,000*l.* for 1892-96. As the total exports on private account were 14,021,000*l.* for 1887-91, and 15,290,000*l.* for 1892-96, it seems just to conclude that of the export trade, not 20 per cent. goes to Singapore and Penang, as against 40 per cent. thence of the import trade.

It may be further noted that the exports from this country to the Dutch East Indies, though shown in our records as larger than the accounts at the other end show, namely, averaging 1,890,000*l.* in 1887-91, and 2,112,000*l.* in 1892-96, are shown in both records as steadily growing on the whole, with variations of amount which correspond fairly well. The evidence of our record of imports may, therefore, be assumed as indicating well enough the course of trade. There is shown, then, an average import from Dutch possessions in the Indian seas of 2,104,000*l.* for 1887-91, and 1,010,000*l.* for 1892-96. Germany records a growing import from this source, reaching about 2,500,000*l.* on the average for 1892-96; the French imports are under 1,000,000*l.*, and decreasing, those into the United States are about 2,000,000*l.*, and increasing. The fact, too, that the record of imports into Holland from her East Indian possessions shows some 12,661,000*l.* for the annual average of 1887-91, and 17,280,000*l.* for 1892-96, confirms the statement that the great bulk of the exports of these colonies go to Holland, and apparently the proportion is increasing.

Turning now to Surinam, we find the following state of the export trade :—

Exports from Dutch Guiana.

[000's omitted in amount columns.]

Average of Years.	Total Amount.	To Holland.	Percentage to Holland.
	£	£	
1887–91	311,	116,	37˙3
'92–96	404,	122,	30˙2

The destinations of exports from Curaçao, and even the total value of exports, is not supplied. The latter but not the former

is given for the other Dutch West Indian Islands, being as follows for the periods 1892-96 :—

Exports.   Annual Average, 1892-96.

		£
Bonaire	....	4,701
Aruba	....	16,457
St. Martin	....	5,946
St. Eustatius	....	990
Saba	....	919

or a total of 29,013*l.*

Holland records an export to Curaçao averaging over these years just over 36,000*l.*, and an import just under 36,000*l.*

The United States records an import from Dutch West Indies amounting to about 30,000*l.*, and an export thither of about 130,000*l.* What precise share in the trade this represents cannot be stated in the absence of export figures for Curaçao and import figures for the other islands. The large share which the United States takes in the trade of the West Indies generally, and the fact that the trade statement of Surinam shows about 26 per cent. of the imports to be from the United States, and over 48 per cent. of the exports to be sent thither, gives some interest to the statement of the American records of trade with the Dutch West Indian Islands.

A comparison of the present position of Dutch colonial trade with that of a generation ago, as was done with the British and French colonies, presents one feature of very considerable difficulty. The source of the figures used in the case of France was the " Statistical Tables relating to Foreign Countries," which came to an end in 1868, and the figures now to be given for Holland and Dutch possessions are derived from the same source. While, however, the movements in the trade are shown as progressing steadily in the trade returns of Holland itself, so that it would appear to be a matter of indifference what particular series of five years were employed to illustrate the state of trade about the time in question, a startling change in the figures of Java trade takes place in 1860, reducing the exports by about one-half in value at a jump. Whether this is the result of a new basis of valuation or of some other cause is not indicated in the tables. It appears desirable, on account of this change, to give the figures, not for a single five-year period, but for one such period preceding the change noted, and for a second dating from the beginning of the lower figures. We take, therefore, the two periods 1855-59 and 1860-64.

Trade of Dutch East Indies and Surinam.

[000's omitted in amount columns.]

Annual Average.	Total Imports.	Imports from Holland.	Percentage from Holland.	Total Exports.	Exports to Holland.	Percentage to Holland.
	£	£		£	£	
East Indies—						
1855–59	3,062,	1,091,	35·6	8,310,	6,191,	74·5
'60–64	3,712,	1,521,	41·0	4,396,	2,460,	56·0
Surinam, 1855–59 ...	239,	119,	50·0	332,	196,	59·1

It will be observed that the falling off in exports to Holland is greater in proportion than the reduction of exports as a whole, as represented by the record. Some other change than a mere change of basis of valuation would appear to be involved. I was unable to regard ignorance of the nature of the change in the mode of preparing the record as a sufficient reason for avoiding reference to the very striking fact.

The figures from the trade returns of Holland itself may be compared with the colonial statement :—

Trade of Holland with her Colonies. (*General Trade.*)

[000's omitted.]

To or From	Exports.		Imports.	
	1855-59.	1860-64.	1855-59.	1860-64.
	£	£	£	£
Java	2,422,	3,767,	6,672,	7,051,
Surinam	118,	209,	309,	234,
Curaçao	27,	34,	24,	22,
Total colonial	2,567,	4,010,	7,005,	7,307,
„ of all countries	28,040,	32,990,	33,075,	38,063,
Percentage of colonial........	9·2	12·2	21·2	19·2

It will be seen, on comparing this table with the last, that the recorded import to Holland from Java increased between the intervals selected for comparison, while as was observed the recorded export from Java to Holland fell from a figure corresponding fairly well with the Dutch record to much less than half that amount. The recorded export from Holland to Java in both periods stands far above the amount shown in the colonial record.

The proportion of the colonial trade to the total Dutch trade stood far above what the more recent figures show. Had we

taken the figures of *special* trade these percentages would have been even greater.

Trade of Portuguese Colonies.

The information on this section of my inquiry which I am able to present is far from satisfactory. Consular reports dealing with Portuguese East Africa provide certain statements available for my purpose, and the "Statesman's Year Book" has been my resource for a statement relating to the total of import and export trade of the other colonies for any date not too distant to be useful. For comparison I state alongside the total trade movements the corresponding figures from the Portuguese trade returns, so as to provide some measure of the proportionate extent of trade between the colonies and Portugal.

Trade (excluding Transit Trade) of Portuguese Colonies in 1896.

[N.B.—Amounts are stated in milreis.]

	Exports from Portugal to the Colony.		Imports into the Colony.	Exports from the Colony.	Imports to Portugal from the Colony.	
	Portuguese Products.	Total.			Total.	For Portuguese Con- sumption.
Angola	1,733,800	2,645,600	3,750,273	4,668,361	4,588,500	246,300
Cape Verde	229,800	445,900	1,595,900	386,500	313,600	279,500
Guinea	43,900	108,500	283,000*	221,000*	51,800	10,900
S. Thomé and Principe	377,400	581,200	1,055,500	2,283,917	2,069,800	483,700
East Africa	486,800	630,700	4,902,711	803,409	39,900	37,200
Goa	24,000	33,600	191,089†	22,277†	36,400	36,400
Macao and Timor	4,200	4,200	‡	§	200	200
Total..................	2,899,900	4,449,700	11,778,473	8,385,464	7,100,200	1,094,200
	652,480*l.*	1,001,200*l.*	2,650,156*l.*	1,886,729*l.*	1,597,500*l.*	246,200*l.*

* 1895.   The Portuguese trade with Guinea was larger in 1895 than in 1896.

† 1897.

‡ In 1894 a trade to the value of 886,000*l.* imported, and 680,000*l.* exported, passed through the Chinese custom house at Lappa.   [*cf.* "Deutsches Handels-Archiv."] Imports into Timor, 1893, 123,130*l.*; exports, 1892, 80,500*l.* [*cf.* "British Consular Reports."]

§ Opium to the value of 285,600*l.* was exported.   (*Cf.* "Statesman's Year-Book," 1898.)

It would appear from this table that the imports into Portuguese colonies might be estimated as coming to the extent of about one-half or less from Portugal, though only one-third or less of the imports were Portuguese goods.   The exports are directed to the extent of about two-thirds to Portugal, but these reach Portugal in the main not as an ultimate destination.

The consular reports issued within the last month or two relating to the trade of Portuguese East Africa afford some valuable information on its trade from the point of view of this paper. In regard to Beira a remarkable growth is shown in recent years in imports, the imports of 1898 (incompletely returned) being given as six and a half times those of 1895. The year 1896 shows imports double those of 1895, and 1897 was similarly related to 1896. It is possible that the completed returns for 1898 may bring its figures even nearer than as stated in the report, to showing a doubled import for the third time. The exports show considerable progress, but irregularly and to a quite slight degree in comparison with imports. Of the 911,163*l.* of imports in 1898 into Beira, 106,298*l.* is stated to be from Portugal and 505,364*l.* from Great Britain and colonies.

Of the trade of Mozambique nothing further need be added from the consular report, while as to Quilimane the chief further point afforded is the considerable decrease of trade since 1891 and the neighbouring years, the lowest point, with trade less than half that of 1891, being reached in 1897.

At Lourenço Marques imports advanced rapidly between 1894 and 1898 being 221,000*l.* in the former year, and reaching over 750,000*l.* both in 1897 and 1898. Meanwhile exports fell off considerably. In 1897 of the 754,416*l.* of imports, those from Portugal amounted to 255,219*l.*, while 299,148*l.* came from Great Britain and her colonies, rather over half of this being from Great Britain. In 1898 almost exactly one-third of the imports were from Portugal. The transit trade grew very rapidly in the five years in question, reaching 2,660,000*l.* in 1897.

The rapid growth of imports into Lourenço Marques and especially into Beira in recent years has an obvious explanation which prevents their records being taken as illustrative of the conditions of Portuguese colonies in general.

Throughout the statement relating to Portugal and her dependencies the milreis has been taken as equivalent to 4*s.* 6*d.* sterling, a merely nominal rate, but one which avoids the difficulties of changing rates of exchange.

Trade of Spain's former Colonies.

In dealing with this section of the inquiry, the facts adduced will be limited in range to the cases of Cuba, Porto Rico, the Philippines, and the Canaries. On all but the last of these, recent publications of the United States Government departments provide material, from which I select what is necessary for my purpose.

The Consular Report (Annual Series, No. 1851, 1897) gives valuable information as to Cuban trade not fully utilised in the

American statements. Taking the two years beginning April, 1894, and April, 1895, the trade of Cuba was as follows :—

Imports into Cuba.

[000's omitted in amount columns.]

	Total.	From Spain.	Percentage.	From United States of America.	Percentage.
	£	£		£	
1894–95....	18,358,	6,882,	37˙5	6,723,	36˙6
'95–96....	14,291,	6,936,	48˙5	3,414,	23˙9

Exports from Cuba.

[000's omitted in amount columns.]

	Total.	To Spain.	Percentage.	To United States of America.	Percentage.
	£	£		£	
1894–95....	22,634,	2,344,	10˙4	19,132,	84˙5
'95–96....	20,388,	2,173,	10˙7	17,260,	84˙6

The rather exceptional events affecting Cuban trade, however, make it desirable to attempt to secure a more extended comparison than the above.

Reference to the "Übersichten der Weltwirthschaft," Lfg. 16, provides us with a statement of the total imports and exports of Cuba for the quinquennium 1886–90, and for each of the three years 1890, 1891, 1892. This enables the following table to be prepared, some of the later figures being repeated for comparison :—

Cuban Trade Statement.

[000's omitted.]

	Total Imports of Cuba.	Exports to Cuba from		Total Exports of Cuba.	Imports from Cuba to	
		Spain.	United States of America.		Spain.	United States of America.
	£	£	£	£	£	£
1886–90	8,445,	2,914,	2,293,*	13,400,	1,535,	10,519,*
'90........	9,825,	3,487,	2,740,†	14,315,	1,782,	11,229,†
'91........	10,355,	4,594,	2,973,†	15,145,	1,491,	14,241,†
'92........	12,200,	5,813,	4,572,†	14,200,	1,984,	16,080,†
'94........	18,358,‡	4,682,	3,533,†	22,634,‡	1,506,	15,707,†
'95........	14,291,§	5,450,	1,952,†	20,388,§	1,487,	10,631,†

* Fiscal years ending 30th June.   † Calendar years.
‡ Year ending 31st March, 1895.   § Year ending 31st March, 1896.

The growth in Cuban imports, especially from Spain, is brought out here to which reference was made at an earlier page (see p. 492). The influence of Cuban disturbances on the trade of its powerful neighbour and present protector is also effectively shown. The difference in the amounts of trade between Cuba and Spain and between Cuba and the United States shown here and in the preceding table, may be due to the nominal rate of conversion used for turning Cuban currency into sterling.

In regard to Porto Rico, the United States Department of Agriculture gives, in Bulletin No. 13 of the section of Foreign Markets, information which enables such comparisons as those made in this Paper to be readily instituted. The following is extracted from this report :—

Trade of Porto Rico.

[000's omitted in amount columns.]

From or to	Imports.				Exports.			
	1887-91.		1893-96.		1887-91.		1893-96.	
	£	Per cnt.	£	Per cnt.	£	Per cnt.	£	Per cnt.
Spain	847,	28·6	1,205,	32·5	470,	21·4	847,	24·8
United States	699,	23·6	866,	23·8	618,	28·7	541,	15·8
All countries	2,963,	100·0	3,644,	100·0	2,168,	100·0	3,414,	100·0

As a source of imports, the United Kingdom takes the third place, and Cuba, as a destination for exports, rises from third to second place in the interval covered by the table.

The figures on which the above table is based are stated to be derived, as to the years 1887-91 and 1893, from the "Deutsches "Handels-Archiv," which quoted them as from the original Porto Rico trade returns. As to 1894 and 1895 the source is the official returns of trade of the island, and the 1896 figures were obtained from the customs officials in advance of publication.

For 1892 the separation of trade according to countries is not available, but the totals of the trade movement are not, on the import side, greatly different from neighbouring years, and, on the export side, were quite similar to those of succeeding years, there being a leap upwards at this point, marking an advance which was maintained. The nominal gold value of the peso has been used in converting the values into sterling.

A comparison of Spanish with Porto Rican accounts shows a want of precise agreement, but, in the totals of trade, the indications of change from period to period are similar. The island accounts, however, show a markedly slower growth of imports from Spain than do the Spanish accounts of exports to Porto Rico.

In the item of coffee, as a particular specimen of disagreement, the island records for 1894-96 show an export to Spain of 600,000*l.* in value, while the Spanish records show an import of barely 570,000*l.* The difference is not due to incorrect reductions of the peso and peseta respectively, for Porto Rico records for these three years an average annual export to Spain of over 12,800,000 lbs. of coffee, while Spain records a receipt of only 11,651,233 lbs. on the average from the island. This is an illustration of the differences in records which profess to represent the same transaction.

In dealing with the trade of the Philippine Islands, as well as in the case of Porto Rico a bulletin (No. 14) of the United States, America, Department of Agriculture, section of Foreign Markets, affords collected information. For the years included in what follows, the statements are quoted from French and German consular reports, reference being made as to 1881 and 1891-93 to the "Moniteur Officiel du Commerce," and as to other years for which figures are here quoted, down to 1894, to the "Deutsches "Handels-Archiv." Taking the total trade of the islands, quinquennial averages from 1880 onwards show little considerable change in exports, apart from some slight fall (measured in sterling) in the latest years. On the import side the averages for 1885-89 and 1890-94 are substantially the same. The figures for 1890-94 will therefore fairly indicate the total extent of the trade over some time. These give, for imports, just over 3,250,000*l.*, and for exports just over 4,000,000*l.* The exports and imports of coin and lottery tickets are separately recorded for the years 1883-90, but do not introduce substantial alterations in the figures given except in the case of export of coin, which averaged about 450,000*l.* per annum for those eight years.

The details of the trade of the Philippines by countries are only given in the bulletin referred to for the years 1881, 1892, and 1893, for which alone they were procurable. In the "Monthly "Summary of Trade and Finance" for February, 1899, further particulars are given for 1894 and for 1896. From these the following statement is prepared:—

Trade of the Philippines with Spain.

[000's omitted in amount columns.]

Year.	Imports.			Exports.		
	Total.	From Spain.	Per Cent. from Spain.	Total.	From Spain.	Per Cent. to Spain.
	£	£		£	£	
1881....	3,801,	281,	7·4	4,497,	200,	4·4
'92....	3,353,	904,	27·0	3,939,	378,	9·6
'93....	3,266,	1,049,	32·1	4,560,	394,	8·6
'94....	2,934,	1,077,	36·7	3,395,	297,	8·8
'96....	2,185,	—	—	4,147,	—	—

I have not used here figures given in the latest report of H.M. Consul at Manila, on account of reasons given in the American statement for believing that the import figures are considerably deficient.

In reference to this table, one point is of importance similar to what was mentioned in the case of Java, namely, that a very considerable proportion of the trade is carried on *viâ* Hong Kong or Singapore, and thus ultimate origins or destinations are masked. This feature is much more important in the 1881 returns than in those for later years.

On the import side, more continuous information is recorded in the bulletin, from which it appears that in the four years 1885-88 Spain contributed 8·8 per cent. of a total import averaging 3,172,000*l.*; and that in 1891-93 there was obtained from Spain 26·3 per cent. of a total import averaging 3,358,000*l.* The United Kingdom was the most important source of the imports of the islands (and the tables previously under consideration show it to be a yet more important destination for exports, in relation to other countries); and Hong Kong and Singapore bulk less largely at the later than at the earlier date, as already noted. Some of the changes in distribution of trade to and from other countries may be associated with this lessened degree of importance of trade *viâ* these free ports.

The indication of increased exports from Spain to the Philippine Islands afforded by preceding tables is confirmed by examination of the Spanish records relating to the trade. From 178,000*l.* in 1887, there has been a steady increase, only interrupted in 1895, till in 1896 the export of Spain to these islands reached 1,521,000*l.* Comparing these records with those of the United Kingdom and other countries, it would appear that, since 1892, Spain has occupied the first place in the trade, and that, by 1896, she was as much ahead of Britain here as she was behind in 1890. In the converse current of trade, as judged by the records of the countries

importing Philippine products, the United Kingdom occupies the most important place, the United States ranking second, and Spain third in importance.

From these somewhat scattered records of the trade of the former Spanish colonies, I do not propose to attempt to compile a summary table similar to those which have preceded. The general results, however, appear to be that Spain was not so important a factor in the trade of her great colonies now lost as the other countries which have been passed under review.

In reference to the trade of the Canary Islands, though complete records are not available, the information supplied in the "Consular Reports" (Annual Series, No. 246 of 1892, and No. 1828 of 1896) from Teneriffe gives some addition to our materials, namely, the following summary prepared from the reports in question. It will be observed that over half the trade is with Britain.

Trade of the Canaries.

Year.	Imports.				Exports.			
	Total.	From Spain.	Percentage from Spain.	From Britain.	Total.	To Spain.	Percentage to Spain.	To Britain.
	£	£		£	£	£		£
1887–91	537,898	45,860	8·5	287,607	283,918*	7,588†	2·7†	133,451
'92	575,017	33,876	5·9	307,160	438,931	34,661	7·9	234,219
'93	588,387	60,516	10·3	344,020	612,350	100,330	16·4	319,238
* 267,884*l.* in 1891.					† 1891 only.			

Trade of Danish Possessions with Denmark.

The records of trade of the external possessions of Denmark are not complete. So far as concerns the islands of the West Indies, such information as was available was issued as a report from the Statistical Bureau in Copenhagen in 1897. ["Sta-"tistiske Meddelelser." Tredie Række, 18de Bind.]

The larger island, St. Croix, provides a record of both import and export trade, as follows:—

Average of Years.	Import.			Export.		
	Total.	From Denmark.	Per Cent. from Denmark.	Total.	To Denmark.	Per Cent. to Denmark.
	£	£		£	£	
1884–85 to 1888–89	151,000	4,990	3·3	124,000	14,630	11·8
1889–90 to 1893–94	153,500	3,985	2·6	125,000	10,880	8·7

The imports into this island from its neighbouring Danish colonies are many times more important than those from the mother country, but, as shown by the records for the last four years of the ten, the trade is very largely a trade with the United States, nearly three-fifths of the imports and nearly four-fifths of the exports being assigned to the trade with that country.

Taking now St. Thomas, the trade recorded is much larger, because this island does a considerable *entrepôt* trade. The imports only enter into the published record, and the summary of that record is as follows:—

Import Trade of St. Thomas.

	Total Imports. Annual Average.	From Denmark.		From United States.	
		Value.	Percentage.	Value.	Percentage.
	£	£		£	
1884–85 to 1888–89	314,200	9,900	3·1	71,100	22·6
1889–90 to 1893–94	223,300	5,700	2·6	73,900	33·1

To obtain the total import from Denmark to both islands, such imports to St. Croix from Denmark as reach that island *viâ* St. Thomas must not be reckoned twice. The outcome of the summation, with this proviso, is the following:—

Import to Danish West Indies from Denmark.

	Island Records.	Danish Records.	
	£	£	
1884–85 to 1888–89	12,830	12,110	
'89–90 ,, '93–94	9,550	10,390	

The division of the total export trade cannot be made, nor any separate statement for the island of St. John.

A consular report just issued ("Annual Series," No. 2285, 1899) supplies some information on the trade of Iceland. It is there stated that the total imports and exports of the island in recent years have been as follows:—

Total Value of Goods Imported to and Exported from Iceland during the Years 1891–96.

Year.	Value.		
	Imports.	Exports.	
	£	£	
1891–95 (yearly average)....	356,373	340,353	
'95...	403,888	416,222	
'96...	459,834	392,888	

The proportion which the trade with Denmark bears to the total trade is stated in the report for the years 1895 and 1896. The figures are given in the following table :—

Trade of Iceland with Denmark.

	Total Value.	Amount of Trade with Denmark.	Percentage with Denmark.
	£	£	
Imports { 1895........................	403,888	272,541	67·5
'96........................	459,834	305,208	66·4
Exports { 1895........................	416,222	143,087	34·4
'96........................	392,888	117,619	29·9

It may be added that the report records an export to Britain somewhat greater than that to Denmark in each of the two years, while the imports from Britain were, approximately, one-third of the value of those from Denmark.

Trade of German Colonies with Germany.

Annual Average, 1892-96.	Total Imports.	German Exports thither.	Total Exports.	German Imports thence.
	£	£	£	£
German East Africa	371,500	95,800	230,650	33,500
Cameroons	261,500		213,800	
Togo	110,300	} 185,000 {	134,200	} 176,650
South-West Africa	?		?	
Marshall Islands	?	10,700	?	9,850
Total	743,300	291,500	578,650	220,000

The returns of German exports to South-West Africa are separated from those from the other possessions on the West African coast for the first time in 1897. For that year a recent Foreign Office Report [Miscellaneous Series, No. 474, 1898] and the statement of " Trade and Shipping of Africa," already referred to, enables the following tables to be compiled for the African colonies of Germany :—

Imports into German African Possessions, 1897.

	Total Imports.	Imports from Germany.	Percentage from Germany.	German Exports thither.
	£	£		£
Cameroons	268,000	?	?	} 224,000
Togo	94,000	?	?	
South-West Africa	244,366	183,000	75	143,000
German East ,, ...	478,851	128,846	27	92,000
Total....................	1,085,217	—	—	459,000

Exports from German African Possessions, 1897.

	Total Exports.	Exports to Germany.	Percentage to Germany.	German Imports thence.
	£	£		£
Cameroons	198,000	?	?	} 178,000
Togo	83,000	?	?	
South-West Africa	62,337	7,550	12	10,000
German East ,, ...	261,533	58,100	22	38,000
Total....................	604,870	—	—	226,000

No sufficiently complete statement of the trade of the other German possessions can be given to show the proportion of that trade carried on with Germany. The tables given appear to show that the German share of the colonies' trade does not much, if at all, exceed 40 per cent.

After so long a series of tabulations, it is quite out of the question to attempt to rearrange the material for purposes of direct comparison of what is really comparable. Further, only totals of trade have been dealt with, not details and the commodities entering into the trade. Again, for the most part the direction of the trade has not been indicated, except in the one point of its extent with the metropolitan State. I am aware of these omissions and of the very limited usefulness of a paper omitting such facts as these, and also neglecting to consider such matters as the singling out of the most and least prosperous of each group of colonies, leading to inquiries such as that into the reasons for the superiority of Indo-China in the progress of its trade and industry over other French colonies. I have only placed before myself on this occasion a limited inquiry, namely, into the materials for finding an answer to a part of the question, " What " are the facts ? " The question, " Why are things as they are ? " is probably far more important, but cannot be entered upon on this occasion.

I will only bring together one portion of the facts, for the purpose of indicating where some application of such materials might perhaps begin.

I do not propose to comment on this table beyond pointing out that, as some of the estimates of population are quite rough, those of Cuba and Porto Rico to wit, the deduction of trade per head is also only approximate. The nature of the trade of St. Thomas makes its amount exceptional, and many other qualifications are necessary before any very useful results can be deduced from such a comparative statement. It would not, however, be impossible to institute some useful comparisons between portions more similar

The Trade of the West Indies and Guianas.

	Area (Square Miles).	Approximate Population.	Average Imports. (000's omitted.)		Average Exports. (000's omitted.)	Foreign Trade per Head (to the nearest Sixpence).		
			£		£	£	s.	d.
British West Indies	12,058	1,400,000	6,587,	(1892-96)	5,948,	8	18	6
French ,,	990	360,000	1,972,	('87-91)	1,797,	10	9	6
Cuba	41,655	1,630,000	10,793,	('90-92)	14,553,	15	11	—
Porto Rico	5,300	800,000	3,644,	('93-96)	3,414,	8	16	6
British Guiana	109,000	280,000	1,631,	('92-96)	2,100,	13	6	6
French ,, ...	47,000	30,000	360,	('87-91)	198,	19	12	—
Dutch ,, ...	46,072	65,500	462,	('92-96)	404,	13	4	6
Curaçao, &c.	436	50,000	272,	('92-96)	?	5	9	—*
Danish West Indies	120	32,800	†347,	('89-94)	?	10	11	—*

* Imports only.
† Omitting imports to St. Croix from other Danish West Indies.

and comparable than the units of this last table. Any such use of the records must be postponed. The reference to them may suffice to show that I do not suppose that such a collection of tables as is contained in this paper constitutes something worth seeking as an end in itself, but rather that it, or something like it, may serve as a means to attain ends not here aimed at. Were they more perfect they would serve such ends better, and the lack of completeness has been a source of great regret to me in preparing the paper. I can only trust that it is not so far lacking in this and other respects as to be considered unworthy of the attention of this Society.

Summary of Results.

(1) The proportion which colonial trade bears to total trade is, except in the case of our own country and Spain, not large: it is, however, on the side of imports, considerable in the cases of Holland and Portugal, and important on both sides in both these cases and in that of France. It is, too, apparently of growing importance.

(2) The external trade of the various British colonies and possessions takes place to the extent of over one-half with the mother country, to the extent of 65 per cent. within the empire.

(3) If Algeria and Tunis be included among French colonies, some 60 per cent. of the colonial trade is with the mother country. If they be excluded, this proportion falls to 42 per cent., a figure not substantially increased, if to the trade with France, is added that with other French colonies.

(4) The newer French colonies do the greater part of their trade with countries other than France, in this contrasting with the older colonies.

(5) The Dutch East Indies take rather over one-third of their imports from Holland, and send thither the greater part (so far as the record permits of a definite figure, about three-quarters) of their exports. Dutch Guiana does over half its import trade and about a third of its export trade with Holland.

(6) The Portuguese colonies take something like one-third of their imports in Portuguese goods, though nearly one-half of the total are received from Portugal. Portugal receives near two-thirds of the exports, but mainly *en route* for other countries.

(7) The Spanish colonies now lost took well under half their imports from Spain, and sent her only a small proportion of their exports except in the case of Porto Rico, which sent nearly one-quarter of its exports to Spain. Spain occupied a less important position in the trade of her colonies than the great trading nations previously considered.

(8) France and Holland stand contrasted with Britain in the matter of colonial trade, in the fact that, with them, it is the colonies' export trade of which they have by far the larger share in most cases, with us the contrast is not so marked between the proportions of import and export trade carried on by our colonies with us. Further, the large share of the import trade of her colonies which falls to Britain, contrasts favourably with the corresponding percentages in the records of the colonies of other countries.

(9) Comparisons with periods about thirty years back show that the course of the trade of the British Empire with Britain compares not unfavourably with the corresponding course of events in the cases of France and Holland.

(10) The efficiency of the policy of exclusive trade privileges to the sovereign State, whether in promoting its own trade or the trade of its colonies, is not conspicuous in the records.

APPENDIX.

French Trade with French Possessions.

[000's omitted.]

From or To	Imports.		Exports.	
	1887-91.	1892-96.	1887-91.	1892-96.
	frs.	frs.	frs.	frs.
Algeria	177,543,	197,560,	181,490,	198,935,
Tunis..	15,118,	25,200,	17,299,	20,096,
Senegal and Gulf of Guinea	22,309,	22,058,	11,517,	21,078,
Mayotte and Nossi Bé	960,	2,429,	400,	3,265,
Réunion	14,519,	16,406,	6,219,	8,221,
India..	18,181,	10,542,	800,	699,
Indo-China	5,770,	18,436,	12,239,	18,306,
Oceania..	3,456,	9,778,	5,819,	6,024,
Guiana	360,	2,226,	5,252,	8,362,
Martinique	22,346,	19,401,	13,044,	13,257,
Guadaloupe	19,795,	16,115,	11,636,	11,904,
St. Pierre and Miquelon............	29,249,	27,968,	4,365,	5,045,
Total................................	329,606,	368,119,	270,080,	315,192,
	£13,184,	£14,725,	£10,803,	£12,607,

Spanish Trade with Spanish Possessions.

[000's omitted.]

From or To	Imports (including Bullion and Specie).		Exports (including Bullion and Specie).	
	1887-91.	1892-96.	1887-91.	1892-96.
	£	£	£	£
Cuba	1,519,	1,902,	3,281,	6,260,
Porto Rico	676,	1,218,	670,	1,286,
Philippines	863,	878,	343,	1,098,
Canaries	59,	61,	125,	157,
Total	3,117,	4,059,	4,419,	8,801,
Total of all countries	34,828,	33,032,	34,017,	31,695,

Portuguese Trade with Portuguese Possessions.

[00's omitted.]

From or To	Imports.				Exports.			
	1887-91.		1892-96.		1887-91.		1892-96.	
	Special.	Total.	Special.	Total.	Special.	Total.	Special.	Total.
	£	£	£	£	£	£	£	£
Angola	36,3	636,3	49,6	1,149,6	115,5	504,5	309,7	682,2
Cape Verde	34,8	44,4	51,8	71,0	28,4	68,7	47,2	85,0
Guinea	1,2	6,0	6,4	21,5	6,7	13,9	9,2	32,5
S. Thomé and Principe	99,7	252,4	102,5	447,6	32,0	73,0	79,2	131,8
Mozambique........................	2,1	7,7	9,4	13,4	37,4	49,4	65,9	87,7
India.................................	7,2	11,7	10,5	10,5	4,1	4,3	3,6	4,1
Macao and Timor	0,8	0,8	0,5	0,5	0,5	0,5	2,3	2,3
Total colonial	182,1	959,3	230,7	1,714,1	224,6	714,3	517,1	1,025,6
„ of all countries	9,039,0	11,033,2	8,287,9	10,861,2	4,992,4	6,986,8	5,627,8	8,201,1

DISCUSSION on PROFESSOR A. W. FLUX'S PAPER.

MR. H. MONCREIFF PAUL said they must all feel that the Society owed a debt of gratitude to Mr. Flux for gathering together, under circumstances of considerable difficulty, very much valuable information regarding the trade of this and other countries with their respective colonies. He wished to add a few figures with regard to the Australasian colonies, as Mr. Flux had not segregated them from other British possessions. For that purpose he would take the year 1896, to which special reference had been made in the paper. In the group he included Tasmania and New Zealand. Their population was about $4\frac{1}{2}$ millions in round numbers, and their total trade (imports and exports) 129 million £. From that 129 million £, however, it was necessary, in looking at the matter from Mr. Flux's standpoint, to eliminate the intercolonial figures, because no doubt there was a considerable duplication in the statistics of imports and exports from that cause. He believed that that intercolonial trade represented some 54 million £ out of the 129 million £, leaving an external trade of something like 75 million £; and of that last figure 54 million £ was with the mother country, 5 million £ with British possessions, and 16 million £ with foreign countries. What they had to see to was that the Australasian group should

continue to maintain its trade with the mother country, and not allow that trade to go outside of Greater Britain. The trade between the Australasian group and Canada had not increased; but he looked to the results of the proposed Pacific cable to stimulate trade in that direction by cheapening telegraphic communications. But they knew that the Australasian group had in certain particulars withdrawn from the mother country in respect of trade. A portion of their export trade in their main staple, wool, which formerly went entirely to the mother country, had been in recent years diverted to the continent of Europe and to the United States in consequence of improved transit facilities and increased telegraphic communication; and the same causes, in conjunction with cheapness of production abroad, had affected the trade in manufactured articles imported by these colonies. Still there was in 1896 this very satisfactory feature, that out of the total Australasian external trade—75 million £—54 million £ was with the mother country. This compared very favourably with the trade of Great Britain with other countries, having regard to the relatively small population of the Australasian group. Thus the trade between the United Kingdom and the undermentioned more populous countries was as follows: United States of America, 138 million £; France, 71 million £; Germany, 62 million £; and British India, 56 million £. A comparison of the trade of the British possessions with the United Kingdom showed the following proportions: the Australasian group 29 per cent., India $30\frac{1}{4}$ per cent., Canada $11\frac{1}{4}$ per cent., and Straits Settlements and Hong Kong $4\frac{1}{2}$ per cent. So that, as far as British possessions were concerned, the Australasian colonies occupied a very prominent position.

Professor R. MAYO-SMITH said he was very pleased to be present at a meeting of the Society, the deliberations of which he had followed with interest for a great many years, and whose hospitality he was enjoying at the present time. He considered himself particularly fortunate to have been at a meeting when a subject was discussed which was of very great interest to the people of the United States at the present time, and he must say that that interest was more one of curiosity and inquiry than anything else. He could not expect to give to Englishmen any information with regard to the value of colonies as a source of trade, or on the question whether colonies paid or did not. England had been the great colonial power for so many years, and had had so much experience, and carried out such enormous transactions, that it would be very presumptuous on his part to say anything as to the policy of Great Britain with regard to her colonies. His desire was simply to gain information. The position of the United States at the present time with regard to this whole question of dependencies was a very peculiar one. They did not know exactly what they were going to do or what were the advantages and the disadvantages. For that reason they were very much interested in this question of trading advantages, and the question whether trade did follow the flag or whether

trade went to the cheapest market. One point was whether a
country that became a colonial power at the present time could
enter upon those colonies and expect to absorb their trade in the
way in which the older colonial empires had absorbed the trade of
their colonies. Great Britain's colonies were occupied more or
less by Englishmen; and the direct connection between the mother
country and the colony was very close, and the whole influence
was on the side of the mother country. The question then was,
was it possible for the United States, in acquiring foreign posses-
sions of that sort, ever to occupy a position towards them such
as the United Kingdom had occupied through her historical
connection with her own dependencies? That point of view was
primarily purely American; but he would ask Mr. Flux's attention
to this point, whether that consideration did not to some extent
invalidate any general conclusion that it was the simple colonial
relation that turned trade towards the mother country. The
second point they would have to think of in the States was
whether geographical situation had not a more potent influence
upon trade than the flag; but he did not see that Mr. Flux had
dealt with that question at all. For instance, taking Cuba and
Porto Rico, did not the situation of those two islands tend con-
stantly to throw their trade to the United States rather than to
Spain? Again, taking the trade of Canada. Her geographical
situation threw the Canadian trade to a large extent into the
United States; and it seemed to him that even in dealing with
the figures as Mr. Flux had, it might possibly be well to study the
countries separately and see whether their geographical position
did not really tend to counteract the influence of the colonial
connection in many cases. The third point was whether the
facilities of transportation also did not to a great extent determine
the question of trade. Taking the South American countries as
an example, the people of the United States had always rather of a
notion that they ought to have the trade of South America, as they
were nearer to South America than England; they were able to
supply the people of South America with many things they needed,
and could take a great many things they had. Why was it that
the United States did not have the trade with South America
which England had? One explanation was that the United States
had a protective policy which was choking foreign trade. Another
influence was the manning of the merchant marine and the great
transport facilities from England to the States of South America.
There was not apparently any suggestion as to a personal
preference for one nationality; the question was one of transport.
If they could get goods to Europe better, if the foreign exchanges
were more favourable, and banking facilities were greater, the
trade would go to England. Another thing which would occur to
an American was that in this colonial trade the character of the
products which could be exchanged would count very much.
Taking the trade with Australia, England wanted Australian
wool, and Australia wanted English manufactures. The trade
between Australia and the Pacific coast of the United States was
very different. They did not want Australian wool, and Australia

did not want their wheat or raw products. It was a question with him whether England did not hold her own in this colonial trade to a very great extent because she was a manufacturing country, having precisely the commodities that the colonies wanted, and, on the other hand, the colonies had what England needed. But the United States was still a new country; its people were producers of food stuffs and raw materials. It seemed to him that while England might hold on to her colonial trade, it would not be on account of the colonial connection, but on account of the fact that England and the colonies, so to speak, fitted each other. These were the points which he would wish to make; and he must say that most people in the States who had been brought up to English political economy had been rather sceptical about the cry that trade followed the flag. They were inclined to accept the teaching of the older economists, that men sought the best market to buy in and the best market to sell in. Though the colonial connection might be a powerful influence socially on trade lines, America and her infant colonial power would not have very much to gain by it commercially.

Mr. H. BIRCHENOUGH said one's first feeling upon hearing this paper read was one of astonishment at the amount of material it contained. He imagined that in drawing it up the author did not intend to make it at all controversial. He regarded it as a large statistical picture of various countries and various colonial empires, and it would therefore be unfair to expect Mr. Flux to have touched in his paper upon more debatable questions than he could help. So far as the indications of his opinions went, he cordially shared them. He believed that trade did, to a very considerable extent, follow the flag, and he thought so because it seemed to lie very considerably in the nature of the human mind that purchases should follow familiar channels. Undoubtedly the temptation to the experienced business man was to buy in the cheapest market, but, looking at the statistics, it would be seen that the tendency of people who migrated to the colonies was to purchase those articles to which they were accustomed at home. If one examined the figures of our colonial exports, it would be seen that the United Kingdom did its largest trade with those colonies which were inhabited by true colonists—people of our own race—for the simple reason that they retained the same sort of tastes and wants that they had at home. The great extension of trade was in the great self-governing colonies, so like ourselves in every way. He should like to add a word or two in reply to what had fallen from the last speaker. He felt great sympathy with the difficulties Professor Mayo-Smith expressed as lying in the minds of the citizens of the United States. In reply to his first question, he should be prepared to say that a country could not expect to absorb the trade of existing foreign colonies which it annexed in the same manner as it might expect to absorb the trade of colonies which it founded and built up. He would even go further, and say, in illustration, that the United States could not hope to-day to absorb the trade of the Philippines in the same

manner as Great Britain absorbed the trade of the Cape after annexing it in the early years of the present century, for the obvious reason that the political and commercial situation had entirely changed. The rest of the world would certainly now expect the United States in annexing the Philippines to maintain something like an " open door." The States could hardly apply their tariff to the Philippine Islands, and therefore those markets would be open to the whole of the rest of the world in a sense in which the earlier markets were not. But, on the other hand, he was perfectly confident the United States would find an enormous increase of trade through their annexation and colonisation, because by the mere fact of annexation America obtained a position which enabled her to control the finances of the islands. One of the most potent causes of successful trade between the mother country and her colonies was the control of finance. For instance, all the great undertakings for the development of the Philippines, or Cuba, or Porto Rico—the building of railways, piers, and harbours, would be more or less under the control of the United States government or of American mercantile companies. That would bring into the United States a large amount of trade, just as the execution of the great public works in Australia and South Africa brought trade to British shores. Being financed here, the loans raised went out in the form of railway material, telegraphic appliances, and so on. For that reason he was quite confident that, in obtaining political control over territory, the country which obtained that control acquired a very strong position for the purpose of trade. Beginning with official control, the connection became commercial and industrial. The United States had had enormous territory to open up, and at present had its hands full in developing its own resources, but by-and-bye it would overflow its borders. If to-day it did not feel any want of colonies for trade purposes, he felt certain that by the middle of the next century it would have such needs.

He agreed with Professor Mayo-Smith that geographical position must of necessity be a very important factor in trade. That one saw illustrated by the trade between France and Algeria, and by the large trade between the United States and the West Indian Islands. But it did not exercise a paramount or dominating influence. Owing to the improvements in communication, the widespread character of modern commerce, and the immense influence of financial considerations, too much importance should not be attached to geographical proximity, except as regards trade in articles which were more or less perishable. Take the case of South America. When the United States became as great a financial power as Great Britain was, they would to a large extent absorb the trade of South America. But, in his opinion, it would be more because they were a great industrial and financial people than because of their geographical proximity.

On the general question, he argued that Mr. Flux's tables proved that hitherto, in the case of all empires, trade had very largely followed the flag. There were, however, other factors of great influence. If they had tables showing the business which

different countries did with each other's colonies, they would see the strength and power of those influences which lay outside a common country or what was meant by the flag. Some two years ago, he made a study of our trade with the colonies of foreign countries, and he was then obliged to admit that, if it was true that trade followed the flag, it was also true that it followed any and all civilising agencies which established order and stability, in which alone trade could flourish. In spite of the barriers which the French government had set up in order to keep all the trade to themselves (except where there were conventions to the contrary), we did somehow manage to do a very large trade with the French colonies. Taking Tonquin as an example, there was a pause which lasted several years in our trade with that place after the French annexation. But immediately the country was fairly settled, our trade increased, in spite of the French tariffs and attempts to cripple it, and it was still increasing. The same was true even in Tunis. The French did a very large trade with their older colonies, probably because they were largely settled by French people, or people brought up under the influence of French tastes; but when the French annexed new countries in Africa or Asia, it would be found that they did relatively only a small proportion of the trade, because French manufacturers did not supply the particular articles which were required by an undeveloped country. Where the connection had been a long one, where the tastes of the population were the tastes of France, the figures were growing rapidly.

In conclusion, he expressed the conviction that, although many causes combined to produce successful trading relations between a mother country and its colonies, yet the most important single cause was the fact of political connection represented by the flag. That connection was of immense value in the early years, since it afforded guarantees so necessary to confidence in trade, and the longer it lasted the more important it became, owing to the thousand ties—financial, commercial, and social—which it fostered and maintained.

Mr. J. T. TAYLOR said that to answer the question, did trade follow the flag, it would be necessary first to answer another question: was the colony in favour of the flag or did it dislike it? He quite agreed with Professor Mayo-Smith that the mere fact that a colony was a colony would not in itself cause it to trade with the mother country under unfavourable conditions. But in the case of a colony and a mother country, where each felt that a real advantage was to be gained by their continuing to be associated, efforts would be made both by the mother country and by the colony to create such conditions as would be favourable to a common trade. Where you had such conditions—and they would always be created where proper relations existed between the mother country and her colonies—there trade would follow the flag; but in the absence of such conditions trade would to only a very small extent, if at all, follow the flag. He did not think, therefore, that it was a question which could be properly answered

with a simple yes or no. Geographical and other physical conditions had no doubt a bearing upon it, but their influence was slight compared with that exercised by the general relations subsisting between a mother country and a colony. The character of those relations, be they cordial or irksome, must be fully considered in each case before a trustworthy reply can be given to the question, does trade follow the flag?

Mr. P. DE JERSEY GRUT drew attention to a point in connection with the tabulation of statistics of exports and imports between the European countries. Transfers of gold were very properly eliminated in the case of the trade statistics of European countries, none of the European countries, with one exception, being producers of gold; and the transfers of gold between all these countries were almost entirely for the purpose of settling balances of exchange. But the case was wholly different when one of the countries involved in the transactions was a large producer and exporter of gold. That was the case with the Australasian colonies, South Africa, the United States, and one or two other countries. In these figures the gold exports from Australia to the United Kingdom were not included, and it seemed to him that they ought for such a purpose as the present to be included. Gold was as much a trade product in the case of Australia as iron was in the case of Great Britain, and had as much claim to be included in the exports.

Mr. J. BARR ROBERTSON called attention to the fact, in connection with France and her colonies, that the importations from the latter came in free of duty or at a much reduced duty, whereas the productions from other countries had to pay a high duty. This was completely protective in the case of French colonial products entering free of duty, and it was at least a differential duty in favour of colonial products entering France at a much reduced duty against foreign products. Similarly French products were favoured as against foreign in entering the French colonies. That was a reason why there might be a large importation into France from its colonies and a large exportation from France to the colonies, since they were so much favoured in regard to duties at the ports of entry.

Mr. SYDNEY YOUNG suggested that the large trade done with French colonies was chiefly for the support of the official life in those colonies, and if that were taken off the trade would be very much less. It would throw great light on the trade of the colonies and on the point as to whether they were good for the mother country or otherwise, if some statistics could be afforded as to the comparative cost of French and German colonies and our own.   •

Mr. FREDERICK W. LAWRENCE pointed out that if the Straits Settlements were taken out from the other colonies, the percentage of imports by British colonies from the mother country had actually increased from one period to the other.

Mr. R. H. Hooker remarked that the author's last conclusion, viz., that "the efficiency of the policy of exclusive trade privileges to the metropolitan State, whether in promoting its own trade or the trade of its colonies, is not conspicuous in the records," afforded no evidence that the trade of the United Kingdom had lost ground at the expense of those other countries for which statistics were available over a sufficiently long period. To take France as an instance, the author showed that the proportion of the imports of her colonies from the mother country had certainly not increased, but rather declined, during the past thirty years. It would seem to be a fair deduction from this, that whereas thirty years ago the excellence of certain foreign goods was such that the French colonies took them in preference to goods of home manufacture, these colonies were now, in spite of tariff and shipping facilities, still less satisfied with French goods. In satisfying the demands of her colonies, therefore, it would seem that other countries (among which the United Kingdom might not improbably be included) had made more rapid progress than France. It was unfortunate that, owing to their very recent acquisition of colonies, no similar comparison could be made with the United States and Germany, now usually considered our most dangerous commercial rivals.

Mr. M. Macfie dwelt on the importance of a point which had been brought strongly before him in 1887, the year of the great international exhibition in Melbourne, and frequently since that time. That was the remarkable progress which had been made in the exports from Germany and even from the United States to all parts of Australasia. From recent inquiries he found that the ratio of increase certainly did not fall off. If they were to form an adequate idea of the importance of British trade with the other parts of the empire, there was a collateral inquiry of the greatest importance to be made as to whether they were fully alive to the fact that whilst the ratio of our trade with the other parts of the empire might be maintained, the ratio of the trade with Germany and the United States and all other countries with certain portions of the empire might be increasing even beyond the ratio of our own exports to the same destinations. Another question of great importance to England and to the empire at large was the relation of our inter-imperial trade, with the attempt which was now being made extensively and on very patriotic grounds to effect the federation of the empire. The basis of those who advocated imperial federation was undoubtedly that of Zollverein, and consequently they attached greater moment to inter-imperial trade than to the trade between the United Kingdom and foreign countries. He believed the statistics up to date would not quite favour the conclusion towards which they seemed to tend. It would appear that the proportion of trade which we did with other parts of the empire was considerably below what we did with foreign countries. It should be considered therefore whether in their anxiety to promote inter-imperial trade—which formed a comparatively small fraction of

the general trade of this country—they might not be ignoring conditions vital to the trade we did with foreign countries. Without desiring to neglect inter-imperial trade, it would be unfortunate if they were to take any step which might prejudice foreign countries against their own, and excite the notion that they were aiming at inter-imperialism rather than maintaining the old Cobden idea of free trade with the world and "open doors" wherever they could get them.

Mr. J. JOHNSTON, referring to the point introduced by the last speaker, said, if they were to introduce imperial federation, he presumed they would try and carry out the broad principles which that speaker had been telling them should be carried out. It was quite possible that if Australia federated, the free trade colony of New South Wales would be able to get a great many of her principles carried out in the other colonies as well—possibly the whole of them; and if they could federate the whole empire on a free trade basis, and shut up a great many custom houses, it would be a great advantage to the trade of the whole empire and of the world at large. Proximity was of great importance, as Professor Mayo-Smith had shown, but he thought facilities of intercourse were of almost greater importance; and they had a specimen of a great commercial market arising within the last twenty years, through facilities of intercourse. He was one who fully believed that Germany would not have taken the position in the markets of the world she was taking now, had it not been for the action of the German government in subsidising lines of steamers to all parts of the world, and sending her men forward as commercial travellers to push German trade in all directions. If England would school her young men in the languages of the countries to which they were about to be accredited, it would be of far more importance in increasing trade than annexing territory in West Africa or elsewhere.

The CHAIRMAN (Major P. G. CRAIGIE), in closing the debate, proposed to do so by moving a vote of thanks to Mr. Flux. He expressed his opinion, as an old official of the Society, who had heard many papers and debates on different subjects, that they had not often had so many speakers as they had that afternoon, or had a clearer and more definite issue put before them. He would express the satisfaction of the Society that one of their younger Fellows had succeeded in producing from material which at first sight seemed unpromising, and was no doubt incomplete, so good a paper as that to which they had just listened, and one which undoubtedly would be studied, when printed in the *Journal*, with great attention. There was, of course, one general and obvious criticism to be made on the question raised by such a paper—and it applied to any contrasts of trade figures—that aggregates of imports and exports were occasionally deceptive. For if one analysed more minutely the items of which the trade of a particular colony or country was made up, one would discover, as in one or two instances here, reasons, which the totals did not

perhaps suggest, for these strange differences in the course of business between one country and another; reasons which might be as potent as the factors of nationality or geographical position. In this connection he would refer to the notes in the appendix to a paper which he had the honour to lay before the Society in 1897, and which were based on the matters brought before the International Statistical Congress at St. Petersburg. At that gathering Mr. Bateman showed very clearly the extraordinarily varied proportion which raw materials, manufactures, food products, &c., formed of the aggregate trade of different countries; and then full account must be taken of the variations of proportion in determining the direction of the current of colonial imports and exports. Still more plainly did the discussions of the International Institute bring out the extremely varied bases on which different foreign countries prepared their official trade statistics, not only as regards the records of the quantities moved, but also as to their ascription in one case to the actual countries of origin, and in another to the countries through which they had last passed. Especially divergent also were the modes in which values were arrived at in some of the very countries mentioned that day. That was a point on many occasions discussed at the International Congresses. Professor Mayo-Smith, whom they were glad to welcome in that room, would remember that a good many debates had turned on the question whether they could not introduce greater comparability in these respects into the tables and methods of trade statistics. The Society was therefore very grateful to Mr. Flux for having courageously faced the difficulties of these comparisons, and for having dealt so well with the necessarily perplexing data of their foreign trade accounts. He had skilfully skated over some of the very difficult and dangerous ice which always impeded very close comparisons of trade statistics, and it was both his duty and his pleasure to ask the Fellows to join in thanking Mr. Flux for the labour, courage, industry, and ability with which he had prepared this paper and laid it before the Society that afternoon.

Mr. A. W. FLUX, in reply, said he was very grateful for the way in which the Society had received a provincial Fellow and what he had been able to do from the material available in the provinces. At Manchester there was not available that quantity of records of the kind necessary for preparing this paper that were to be found in their own library, and he had to depend on narrower sources of information than he had hoped. He should like to say two things generally before dealing with the discussion. First, with regard to some of the data, he would like to point out that he had carefully said "is recorded" on several occasions instead of using "are," because he felt it was necessary to do so. They had the figures, however, on both sides and so there was an opportunity of comparing the two statements, and he thought they might perhaps be able to arrive at some indication of the real relation. The second point was with regard to the question of gold. He was much obliged to Mr. de Jersey Grut for raising it.

In the paper on p. 493, he noted that the recorded exports from India and the Colonies to the United Kingdom showed an excess of nearly 8,500,000*l.* over the record of our imports from these countries. That was almost entirely due to the fact that one return included gold and the other did not. It was a mistake to think that the figures of the exports from the Colonies did not include gold; they did in almost every case, except that of Dutch East Indies. In the records of European countries and of the United States gold was not included. He felt very much indeed the desirability of efforts for developing the markets at present possessed, as much as of looking out for other worlds to conquer. There was, in his opinion, great room for development even in the home market. He felt bound to put on record his conviction that a vast capacity for development remained in the home market and in the markets of the Colonies. There was probably a good deal more profit, which would be more permanent and more desirable in the long run, to be made out of the existing markets than by scrambling for the rest of the world. That was the feeling he had. He did not put it into the paper because it did not tack on to the statistics in a very logical way.

Mr. Moncreiff Paul had given the figures for Australia for 1896, and if they were compared with those given in the paper they would be found much higher. The reason was that the five years, 1892-96, which, he thought, even in the case of Australia, would give a better indication of the general course of trade than taking any one specific year, included several years when the Australian trade was in an extremely depressed condition and therefore stood rather below the figures for 1896. Professor Mayo-Smith's suggestions were all of them excellent. Reasons why the paper did not attempt to answer all his questions had already been suggested in the course of the debate. The point Mr. Birchenough raised was also important. Invested capital was one of the leading influences tying trade in certain channels, and the country which succeeded in getting control of the trade of another country was the one which invested its capital in developing the industries of that country. Capital was more easily and safely invested in countries whose official language was similar, and whose laws were more easily known than those of a foreign power. Regarding the influence of geographical situation, it might be noticed that the United States, before becoming the possessor of any of the West Indian Islands, had something like half the export trade of these islands coming to her, and from 25 to 30 per cent. of their imports were derived from the United States. In this case geographical position was an important cause of facilities of communication, and probably there were also to be considered banking facilities. Mr. Barr Robertson was very much to the point in saying that tariffs had a good deal to do with directing the imports and exports of the French colonies, but it was a fact that all French colonial produce did not enter France free of duty. It was not true, for example, that French colonial sugar entered France duty free, though some part of it got a partial remission of duty, and they had certain

special considerations in particular directions.   Shipping bounties
also affected the result.   Mr. Macfie had expressed a wish for an
investigation into the ratio between the trade of colonies with the
mother country and with the rest of the world.   The whole paper
turned on the direction of movement, and the proportion of
colonial trade which was carried on with the mother country.
He (Mr. Flux) had shown that the British colonies continued to
buy as large a proportion of their imports from the mother country
as they did twenty-five years ago, taking them altogether, especially
if, as was very properly suggested, they took the comparison with
the Straits Settlements left out, because of the extreme peculiarity
of the trade there.   There only remained one other question—that
raised by Mr. Sydney Young.   In connection with this he would
refer to an extract quoted recently by the " Manchester Guardian "
from the " Bulletin Commercial Suisse," where it was shown that
for a recent year, presumably 1897, the net charge imposed on the
French home treasury for the public service in French possessions
was nearly 4,500,000*l.*, while the total exports from France to her
colonial possessions were 14,330,000*l.*, a very little more than three
times as much as the cost of maintaining the colonial administra-
tions.   One might expand the paper by comparing the expenditure
of the home country on colonial administration with the amount
of probable profit derived from the trade.   This was a question to
which his hearers might be led by the material he had placed
before them.

MISCELLANEA.

CONTENTS:

I.—*On the Representation of Statistics by Mathematical Formulæ*— continued. (Part IV.) By PROFESSOR F. Y. EDGEWORTH, M.A., D.C.L.

MY third division, which is continued here, deals with formulæ which are deficient in *à priori* basis. I have illustrated that deficiency by the case of a form constructed out of two half-probability-curves, so as to present a continuous contour. The construction fits the data well enough.[1] And yet we feel that something is wanting. As we see no reason why such a form should have come into existence, so we scruple to treat it as *the* curve proper to represent the statistics. It strikes us as artificial and manufactured: as an *epicycle* invented to fit the observations, rather than a real orbit deducible from a *vera causâ*.

[1] I regret that in the statement which I gave in the last number of the procedure by which the constants proper to the method of composition are elicited from the percentiles there occurs a serious clerical error. On p. 378, in the first part of the fourth paragraph, u is to be read for x; u, as explained in the Appendix, Note 13, being the number of observations measured from one extremity of the group. By the proposition that in general $\dfrac{d_2 x}{du^2}$ vanishes when $\dfrac{d_2 u}{dx^2}$ does, we obtain from the simple equation (in u) given in the (corrected) text the value of u, and thence (with the equation connecting u and x given in the Appendix) the value of x corresponding to the maximum ordinate. This roundabout method indicated in the text does not in general give the same result as the simpler method given in the Appendix. The perfect accuracy of the former in the particular case instanced was of course only accidental. Both methods are in general rough.

In the Appendix (*loc. cit.*), in the formula four lines from the foot of p. 381, insert u_a to match u_b; and in line 2 of the following page, *for* "given" *read* "not given."

A somewhat similar feeling seems proper with respect to certain received formulæ which present, in a less extreme degree, the characteristic of our third division. I venture to place in this category two of the forms with which Professor Pearson has enriched the science of probabilities, namely, the frequency-curve, corresponding to the "skew point-binomial" and the "generalised probability-curve."[2] I admit that, as compared with our manufactured curve, the Pearsonian formulæ fit the data somewhat better, and are not without some *à priori* basis. The comparison in the first respect is shown in the annexed table. The percentage difference between the observed and calculated area is, for our composite probability-curve, 6·55; for Professor Pearson's binomial, 5·21. For his "generalised probability-curve" the error is even less, as might be expected from the fact that it has one more constant at its disposal than the simpler Pearsonian formula and our composite probability-curve.

TABLE IV.—*Comparison of the Composite Probability-Curve with other Constructions.*

Barometric Height in Tenths of an Inch.	Observed Frequencies.	The Composite Probability-Curve.		The Asymmetrical Binomial.		The Generalised Probability-Curve.		Barometric Height in Tenths of an Inch.
		a. Frequencies.	*b.* Errors.	*a.* Frequencies.	*b.* Errors.	*a.* Frequencies.	*b.* Errors.	
286	0·19	0·03	0·16	0·07	0·07	0·09	0·10	286
287	0·42	0·106	0·31	0·14	0·37	0·17	0·25	287
288	0·38	0·271	0·11	0·29	0·09	0·32	0·06	288
289	0·46	0·515	0·06	0·58	0·12	0·60	0·14	289
290	0·69	1·166	0·48	1·09	0·41	1·09	0·40	290
291	1·88	2·284	0·40	1·99	0·13	1·94	0·06	291
292	2·81	3·604	0·79	3·50	0·72	3·34	0·53	292
293	6·04	6·217	0·18	5·86	0·13	5·58	0·46	293
294	9·31	9·837	0·53	9·31	0·13	8·91	0·40	294
295	15·15	15·781	0·63	14·21	0·84	13·67	1·48	295
296	18·62	19·526	0·91	20·41	1·87	19·82	1·20	296
297	26·85	28·906	2·06	27·56	0·75	27·11	0·26	297
298	36·12	31·780	4·34	34·94	1·31	34·64	1·48	298
299	41·27	41·430	0·14	40·99	0·46	40·99	0·28	299
300	45·92	45·530	0·41	44·35	1·79	44·37	1·55	300
301	46·96	43·000	3·96	43·93	3·19	43·64	3·32	301
302	38·88	41·099	2·22	39·21	0·13	38·66	0·22	302
303	30·19	30·788	0·60	31·21	0·92	30·16	0·03	303
304	18·23	20·370	2·14	21·79	3·71	20·75	2·52	304
305	13·65	12·843	0·80	13·08	0·41	12·40	1·25	305
306	7·31	5·845	1·46	6·61	0·57	6·38	0·93	306
307	3·12	2·513	0·61	2·76	0·35	2·80	0·32	307
308	0·38	0·965	0·58	0·87	0·5	1·04	0·66	308
309	0·31	0·269	0·04	0·21	0·01	0·32	0·01	309
310	0·08	0·073	0·01	0·03	0·05	0·09	0·01	310
Sums of errors	—	—	23·93	—	19·03	—	17·93	
Percentages of error	—	—	6·55	—	5·21	—	4·91	

[2] *Proceedings of the Royal Society,* 1895, and *Transactions of the Royal Society,* 1895.

As to *à priori* evidence, it is of a high order for some of the binomials; for example, the one instanced. For, as explained in a former paper,[3] binomials of slight asymmetry are practically coincident with that asymmetrical probability-curve which results from the co-operation of numerous independent agencies, such as presumably are at work *in rerum naturâ.* A binomial of this sort has *à priori* credentials of the highest order; but a binomial *per se* is not a name to conjure by more than any other term of duality —say, "bi-ped." As the bipeds which are rational excel other animals, so the binomials which have a *rationale* excel other frequency-curves. As the two-legged man is of more worth than many sparrows, such is the difference between the slightly asymmetrical and the extreme binomials. In the world of curves indeed the graduation is imperceptible between the two species. It is impossible to fix the point at which the condition that the asymmetry should be sufficiently slight breaks down. Doubtless far beyond the limit within which the binomial is theoretically applicable to the facts, it has some affinity thereto. It belongs to a class which, by a proper choice of constants, may be adapted to the phenomena, not to a class which refuse altogether to be adapted, like the promising but intractable shape which was shown in our introduction[4] to be alien to the law of error.

To the same sort of indefinite affinity—shared by our manu-factured curve—I should be inclined to attribute the close fit of the more "generalised" Pearsonian formulæ, rather than to the derivation from the analogy of games of chance which the author himself relies on. The induction from games of chance is indeed convincing when the matter is one in which games of chance resemble the constitution of nature. Such is the independence of contributory causes illustrated, when we add the number of heads obtained by tossing *n* coins, or the number of pips obtained by drawing *n* cards, and predicate the law of error of the batches thus constituted. The *sums* of heads or pips resemble in an essential attribute those *functions* of numerous independent agencies which we believe to be constantly occurring, or tending to occur, in this universe. But I fail to see that there is any equally general type of *interdependent* causes. Professor Pearson says : " Just as the symmetrical, binomial, and normal curves are illustrated by the tossing of a group of *n* coins, so we can arrive at a series of curves in which the contributory causes are inter-dependent by considering the withdrawal of *r* cards from a pack, &c."[5] I protest against the " Just as : " against the implied

[3] " On some Recent Combinations . . ." *Transactions of the Royal Society,* 1895, p. 514, Note 6.

[4] *Ante, Journal of the Royal Statistical Society,* 1898, p. 674.

[5] See *Proceedings of the Royal Society,* 1895, vol. lvii, p. 238 ; and compare *Philosophical Transactions,* 1895, p. 367 :—

" I do not see that we have any right to select as our sole frequency-curve the normal type . . . in preference to the far more general [type] . . . which not only includes the former, but supplies the element of skewness which is undoubtedly present in many statistical distributions. As we may look upon the

analogy between formulæ, the one of which is true of the universe, and the other of particular games of chance.

Doubtless it is a majestic conception to subsume the varieties of observed groupings under the branches of one family of curves. But a similar intellectual satisfaction may be afforded by other hypotheses. Herodotus tells us that when Hecatæus traced his descent through sixteen generations from a divine ancestor, the Egyptian priests refuted him by "anti-genealogising." I propose in the following paragraphs to direct an argument of this sort against the Pearsonian "generalised probability-curve:" to offer a counter-derivation of the observed groupings, from a quite different stem—the generalised "method of translation."

It was shown in our first part that if a set of observations—say, human statures—fulfil the symmetrical law of error, then very commonly any *function* of those lengths will fulfil that law. That is a first approximation. For a second approximation to the metamorphosed groups, suppose each observation to be measured not in general from the original zero, but from some other determinate point. The *squares* of these lengths will group themselves in a somewhat asymmetrical curve which more nearly approximates to the metamorphosed probability-curve. Thus, in the case of the barometric variations at Babbacombe, ranging from 310.5 to 286.5 tenths of an inch, the new origin was taken at a point distant 13.5438 from the median of the group, that is, at about the point 313.5 (tenths). At a point distant therefrom $3.68\ (=\sqrt{13.5438})$ there is supposed to be placed the centre of a (symmetrical) probability-curve whose modulus is 0.632. If every observation [6] ranging under that curve is measured from 313.5, and squared, the resulting group will very nearly conform to the grouping of the barometrical heights. Or is it easier to say that, with the point $(13.5438 - 3.68)$ as centre, there shall be constructed a symmetrical probability-curve with *unit* modulus, and to represent the group, not as before by $(3.68 + 0.632\xi)^2$, but by $0.632^2\ (3.68 \div 0.632 + \xi)^2$, or $0.4\ (5.8 + \xi)^2$, where ξ assumes values between, say, $+3$ and -3, with the frequency assigned in the tables for the error-function? In general we may write $f \times (a + \xi)^2$, where f has the same meaning as in our first part (the square of the modulus of

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former as a limit to the coin-tossing series, so the latter represents a limit to teetotum-spinning and card-drawing experiments. It is not easy to realise why nature or economics should from the standpoint of chance be more alike to tossing than to teetotum-spinning or card dealing."

According to the view here taken, nature *is* more akin to coin-tossing than to the mode of card-dealing in question; because the former illustrates the independence of contributory causes as it occurs in general, while the latter illustrates only a particular species of interdependence. As to the first of these propositions, see Note 4 of the Appendix to Part I of this paper (*Journal of the Royal Statistical Society,* 1898, p. 694); as to the second proposition, see Note 7 of the Appendix to the paper "On some Recent Contributions."—*Journal of the Royal Statistical Society,* 1895, p. 514.

[6] More exactly, every element $y\ \Delta\ x$ considered as a rectangle of height y and base $(y + \Delta x) - y$ is transposed so as to stand on a base $(y + \Delta x)^2 - y^2$ with a height inversely proportional to the base.

the generating probability-curve),[7] and a is a *numeric*, or absolute number, not varying with the unit, whether inches or centimetres, in which the observations are measured. Upon the magnitude of a depends the plausibility of the construction. If a is well above 2, as in our example, where it is 5·8, the series of squares is very likely to be coincident with the series of values given by some function other than the square.

If a is not very great, we may proceed to a third approximation by regarding the series as formed by measuring from a new origin properly determined the series of values

$$f\,(a - \xi)^{2} + k(a - \xi),^{3}$$

where ξ varies as before, f and a have not in general the same values as before, and k is a new constant. The new set of constants, viz., f, k, a, and the position of the origin, may theoretically be determined from the first *four* moments by an extension of the method which was explained in our first part. But the analogues of the equations which were there handled become extremely complicated, and it is better to follow the analogy of the method of *percentiles* there given.

Assuming that the order of the elements or columns which make up the curve is not disturbed over the great part of the area by the *translation*—an assumption which is commonly justifiable when a is large—we may state the problem thus. The median of the actual group being given by observation, to find the abscissa x measured from that median in terms of ξ, the abscissa measured from the centre of a generating probability-curve, with unit modulus. Expanding the last-written expression, we have—

$$x = \xi(2af + 3a^{2}k) + \xi^{2}(f + 3ak^{2}) + kx^{3}\,;$$

or, as we may write it, $i\xi + j\xi^{2} + k\xi^{3}$. In applying this operator to distances from the median on the negative side, it must be remembered that the odd powers of x become negative. If, as seems best, we take the distance from the median given by the operation always in absolute quantity, or positive, then it must be considered that, whereas the transformation of right-hand ξ gives $i\xi + j\xi^{2} + k\xi^{3}$, the transformation of left-hand ξ gives $i\xi - j\xi^{2} + k\xi^{3}$. The constants i and j may both be taken as positive without loss of generality. The constant k may be either positive or negative. For the plausibility of the construction it is desirable that i, j, k should form a descending series.

" *Ante,* 1898, p. 678.

TABLE V.—*Representing the Frequency of different Sizes of Family.*

1	2	3	4	5	6
Size of Family.	Frequency per Cent.	Sums of Col. 2.	ξ.	$\frac{1}{2}\theta(\xi)$.	Frequencies Calculated.
0	6·397				0·586
		6·397	0·965	0·4138	
1	11·642				11·59
		18·039	0·590	0·2979	
2	13·966				13·32
		32·005	0·307	0·1647	
3	14·542				13·0
		46·547	0·060	0·0338	
4	13·390				—
		59·937	—	—	
5	10·576				—
		75·513	—	—	
6	8·166				—
		78·679	—	—	
7	7·164				—
		85·843	—	—	
8	4·861				—
		90·704	—	—	
9	3·667				—
		94·371	—	—	
10	2·516				—
		96·887	—	—	
11	1·343				—
		98·230	—	—	
12	1·002				—
		99·232	—	—	
13	0·469				—
		99·701	—	—	
14	0·171				—
		99·872	—	—	
15	0·043				—
		99·915	—	—	
16	0·021				—
		99·936	—	—	
17	0·043				—
		99·979	—	—	

The conditions required for the plausible application of the method appear to be satisfied by several of the actual groups which I have examined outside those which are amenable to the method of translation proper. They fall mainly under two heads —the very unsymmetrical two-sided, and the altogether one-sided frequency-curve, illustrated by the annexed figures *a* and *b*.

Fig. *a*.   Fig. *b*.

An example of the first species is afforded by the statistics of fecundity given by Professor Pearson in his *Chances of Death.*[8] The second column in the annexed table gives the percentage of the families under observation who have had the number of children specified in the first column. The third column gives (calculated by Professor Pearson) the sums of percentages: *e.g.*, 18·039 is the percentage of the families under observation who have had either no children or only one child; the proportion of observations, as I take it, below the point 1·5; and so on. According to this interpretation, I conceive the (proportionate) number of families without children to cover the space between — 0·5 and + 0·5.[9]

The median, as determined by me, is 3·76, measured from zero. Given the median and percentiles, we can discover from the usual tables the proportion of modulus corresponding to each size of family on the supposition that the group has been produced by *translation* of a probability-curve with unit modulus. By a method of reconnoitring, indicated in the Appendix, we may conjecture, from inspection of the apparent position of the mode, that the required operator is of the kind which has the coefficient of ξ^3 negative. On the supposition that the distance (from the " origin " to the median) above called *a* is 1·6, we have, for the operator—

$$k(6\cdot2465\xi \pm 1\cdot15\xi^2 - \tfrac{1}{3}\xi^3);$$

where k is to be taken so as to make the calculated and observed results agree as well as possible. The value 0·7 seems to work well, and accordingly we have for the translating operator—

$$4\cdot372\xi \pm 0\cdot806\xi^2 - 0\cdot23\xi^3,$$

which, though merely a " first shot," is found to give very accurate

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[8] P. 74 *et seq.*

[9] The figure for this compartment is only by courtesy called an " observation ;" being obtained from *other* statistics of fecundity by an *inference* referred to below, p. 545.

results. Thus, according to the calculation, the upper quartile ought to be at a distance from the median given by the expression—

$$4 \cdot 372 \times 0 \cdot 477 + 0 \cdot 806 \times 0 \cdot 227 - 0 \cdot \dot{2}\dot{3} \times 0 \cdot 1085;$$

that is $2 \cdot 24$ nearly. And, as a matter of fact, the distance is $2 \cdot 29$, the median being at $3 \cdot 76$, and the quartile, intercalated between $5 \cdot 5$ and $6 \cdot 5$, $= 5 \cdot 5 + (75 - 70 \cdot 51) \div 8 \cdot 166 = 6 \cdot 05$ nearly.

More elaborate verifications are afforded by calculating the ξ corresponding to each size of family. It is given in absolute quantity (*cf.* above, p. 538) by the cubic equation—

$$4 \cdot 372\xi \pm 0 \cdot 806\xi^2 - 0 \cdot \dot{2}\dot{3}\xi^3 = x;$$

where x is the distance of each limit bounding the entries in Col. 2, the positive or negative sign being taken according as x is above or below the median. Thus, for $3 \cdot 5$, $x = 3 \cdot 76 - 3 \cdot 5 = 0 \cdot 26$; and accordingly $\xi = 0 \cdot 06$. The values of ξ corresponding to $2 \cdot 5$, $1 \cdot 5$, and $0 \cdot 5$, are similarly found to be $0 \cdot 307$, $0 \cdot 590$, and $0 \cdot 965$, respectively.

By construction the value of x reaches a maximum when $\xi = 1 \cdot 6$; corresponding to $x = 3 \cdot 97$, that is $- 0 \cdot 2$ as measured from the zero of Col. 1 in Table V. As ξ increases after this point, x diminishes; the portion of the probability-curve outside, or on the left of $\xi = 1 \cdot 6$, about $1 \cdot 2$ per cent. of the total, being folded back and laid down over the portion on the right. The effect of this turn-down may be regarded as insensible after the point $\xi = 2$, corresponding to $x = 0 \cdot 1$. Accordingly the calculation of the contents of the intervals $- 0 \cdot 5$ to $+ 0 \cdot 5$, $+ 0 \cdot 5$ to $+ 1 \cdot 5$, &c., from the values of ξ by the usual tables is not interfered with. The results are exhibited in Col. 6; which shows a fair agreement with Col. 2, when it is remembered that we have been working with a mere "trial" operator. There is no doubt but that much greater accuracy is attainable by a second approximation.

Another type is exemplified by the statistics of American divorces which Professor Pearson has given in his second Contribution.[10] As I understand the statistics, there have occurred, out of a total of 109,986 divorces, 5,314 in the course of the first year from the date of marriage, 7,483 between the dates one year and two years after marriage, and so on. For the median I find $6 \cdot 83$ (years, measured from the date of marriage as zero). Having ascertained, by means of Col. 3, the position of certain percentiles specified in Col. 4, *e.g.*, $20 \cdot 2$ per cent. at 3, $85 \cdot 1$ per cent. at 16, I find the corresponding values of ξ from the usual tables. To find (a first approximation to) the operator for transforming ξ to x, I observe that the mode is somewhere between 3 and 4, there being comprised between the mode and median (at $6 \cdot 83$) apparently more than a quarter, say $0 \cdot 3$, of the

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[10] *Transactions of the Royal Society*, 1895 A, Ex. 9, p. 395.

Table VI.—*Representing the Frequency of Divorces at different dates after Marriage.*

1	2	3	4	5	6
Years after Marriage.	Number of Divorces.	Sums of Col. 2.	Sums as Percentages.	ξ.	$6·83 \pm x$.
1	5,314	5,314	0·86	− 1·175	0·7
2	7,483	12,797	11·7	− 0·85	1·6
3	9,426	22,223	20·2	− 0·59	2·7
4	9,671	....	....	....	....
5	9,014	....	....	....	....
6	8,274	49,182	....	....	....
7	7,021	56,203	....	....	....
8	6,093	....	....	....	....
9	5,305	67,601	61·5	+ 0·207	8·8
10	5,002	....	....	....	....
11	4,384	....	....	....	....
12	4,089	....	....	....	....
13	3,563	....	....	....	....
14	3,144	....	....	....	....
15	2,931	....	....	....	....
16	2,721	93,435	85·1	....	....
17	2,217	....	....	....	....
18	1,877	....	....	....	....
19	1,577	....	....	....	....
20	1,459	....	....	+ 0·968	19·2
Remainder	9,401	109,986	100·0	....	....

total number. Using this value conjecturally and putting for α 1·6, I find for the required operator—

$$x = k \left(8·96\ \xi \pm 3·6\ \xi^2 + \tfrac{1}{3}\ \xi^3 \right);$$

where k is a factor to be determined by trial. I find the assumption $k = 1$ to work well enough. Determining each value of x on that assumption, and subtracting it from, or adding it to (for points above the median) 6·83, I find the calculated portion of

certain percentiles of which the observed portion is given by Col. 1. There will be found, I think, a general agreement between the observed and calculated portion, *e.g.*, observed 20, calculated 19·2; observed 9, calculated 8·8. The agreement is as good as could be expected from a mere first shot. A much better result could no doubt be attained by the methods of second approximation given in the Appendix.

The generalised method of translation may also be applied to the lop-sided curves which the frequency of petals, as tabulated by Dr. Ludwig, present.[11] The construction proves to be less plausible in these cases; and the hypothesis of a real derivation from a probability-curve is not strongly suggested as the true one.

The hypothesis becomes less satisfactory, the method purely formal, when we reach the unilateral curves illustrated by fig. *b*. We can now no longer reconnoitre the ground by observing the approximate position of the mode. The method of procedure may be illustrated by an example consisting of the frequency of blossoms on the axis prolonged beyond the head of a flower of the species *Perumbellatum*, as tabulated by Dr. De Vries and cited by Professor Pearson.[12] The data are reproduced in the first two columns of the annexed table, which, after what has

TABLE VII.—*Representing the Frequency of different Numbers of Blossoms on the Prolonged Axis of* Perumbellatum.

1	2	3	4	5
Number of Blossoms.	Frequency of Number.	Sums of Frequencies.	Sums as Percentages.	ξ.
0	325			
		325	51·6	—
1	83			
		408	64·76	0·268
2	66			
		474	75·2	0·481
3	51			
		525	—	—
4	36			
		561	89·05	0·87
5	36			
		597	—	—
6	18			
		615	97·62	1·4
7	7			
		622	98·73	1·58
8	6			
		628	99·68	1·94
9	1			
		629	—	—
10	1			
		630	—	—

been said with respect to the preceding tables, requires no explanation. For a first approximation let us suppose that the first

[11] *Variationskurven*, Botanisches Centralblatt, 1895.
[12] *Philosophical Transactions*, 1895 A, Ex. xii, p. 402.

percentage is 50, not 51·6, and let us assume, as before, that the position of the median is undisturbed in the sense above explained[13] by the translation. Put $x = i\xi + j\xi^2 + k\xi^3$, where ξ has the same import as before. Then we have, or would have if Col. 4 were completed, as many equations for the three unknown quantities i, j, k as there are entries above the median, that is *ten*. To obtain a first approximation I take any three of the equations, *e.g.*:—

$$0 \cdot 48i + 0 \cdot 48^2 j + 0 \cdot 48^3 k = 2.$$
$$0 \cdot 87i + 08 \cdot 7^2 j + 0 \cdot 87^3 k = 4.$$
$$1 \cdot 94i + 1 \cdot 94^2 j + 1 \cdot 94^3 k = 8.$$

Solving these simultaneous equations, I find

$$i = 3 \cdot 2; \; j = 2 \cdot 56; \; k = -1 \cdot 0\dot{6}.$$

This solution might easily be improved so as to obtain the best possible satisfaction of the ten equations; but those ten equations, as it turns out, do not express the data accurately. Corresponding to the values i, j, k which have been found, the value for α is 0·5. Accordingly when we operate on the generating probability-curve the area thereof outside $\xi = 0·5$ (on the left) becomes *turned down ;* and as ξ increases beyond this point x diminishes. At the point given by the equations $3 \cdot 2\xi - 2 \cdot 56\xi^2 - 1 \cdot 06\xi^3 = 0$, that is a little above $\xi = 0·9$, the "turn-down" crosses, the (assumed) median; and the distribution of frequencies above that point is disturbed by an addition to each compartment, in different proportions from those given by our first approximation, of some 10 per cent. of the total, that being the percentage of the probability-curve which lies outside the limit $\xi = 0·9$ . . The nearer compartments will gain the greatest proportion. These discrepancies can doubtless be considerably reduced by successive approximations, starting from the values of the constants which were first obtained.

" The capacity of the theory of skew variation already developed to cover novel and unusual types of frequency,"[14] is forcibly appealed to by Professor Pearson on behalf of the generalised probability-curve. But we can make that appeal on behalf of the generalised method of translation. We too have our U-shaped curves and other grotesque varieties. Put $x = q^2\xi - \frac{1}{3}\xi^3$; where $x + \xi$ have the same meaning as before, and q is a little less than unity; this metamorphosis will form a curve of the shape of U, the ordinates at the point $\pm q$ becoming infinite. By the introduction of a small term $\pm r\xi^2$, where r has different signs above and below the median, a certain degree of asymmetry may be imparted to the cup.[15] If q^2 is greater than unity, the cup receives what is called with respect to wine bottles a "kick," and we have a W-shaped curve.

When I consider the success which has attended my slight and

[13] Above, p. 538.

[14] *Proceedings of the Royal Society,* 1897-98, vol. lxii, p. 290.

[15] I must confess that I have failed to make the asymmetry sufficient to represent the statistics of *cloudiness* adduced by Professor Pearson (*loc. cit.*).

unskilled efforts at adjustment, I cannot doubt but that a first-rate mathematician, master of the art of approximation, stimulated by the zeal of original discovery, and supported by a band of auxiliary talent, might obtain for the "generalised method of translation" such striking successes in the way of adapting the theory to the facts, as to convince both the author and the world that this is indeed *the* method of representing asymmetrical distributions.

If no more is claimed for the "generalised probability-curve" than that it is the most elegant and workable mode of representing the given statistics as yet proposed, this may be admitted; though even that claim may be questioned with respect to those formulæ which have trigonometric functions in the indices. But the legitimate use of a representative formula not resting on *à priori* evidence, seems to be exceeded when it is attempted to reason up from the observations to the constants of the formula and down again to facts not given by observation.

It is thus that Professor Pearson argues from a certain discrepancy which appears between the curve which he has constructed to represent the statistics of fecundity and the given observations.[16] Because the formula which he has constructed from the whole of the data does not fit certain parts, he concludes that at those points there has been some artificial interference with the course of nature. This argument, I submit, requires to be verified by observing whether other plausible representations of the statistics would afford a similar inference. Very probably that verification would be forthcoming, as it is in the case of the barometric statistics cited in our Tables I and IV. According to all the four representations there given, it may be observed that considerable misfits occur at the same points. At the points 30·1 inches, 30·4, 29·8, the error exceeds, sometimes greatly, unity; whereas, according to all the four formulæ, the median error is below unity. The consilience makes it reasonably certain that there is some real discontinuity at these points.

Conclusions as to the extremities of a group based upon the total data excite graver doubts. But I must admit that many of Professor Pearson's inferences are borne out by the test which I have just suggested. For example, the existence of a limit to the range of barometric variations which he has deduced from his hypothesis is also deducible from our hypothesis. It appears from the construction based on *mean powers* given in our first part, that the limit is at the distance of a^2, that is 13·5438 from the median. A slightly smaller distance is found if we use the values of ac and c^2, obtained by the method of *percentiles*, viz., 2·2 and 0·4. The metamorphosis, as explained in the preceding paragraphs, essentially consists in transposing each element of an asymmetrical probability-curve with unit modulus which is at a distance ξ from the centre of the curve to a distance x from the median of the actual group, such that $x = 2 \times 2\cdot2\xi \pm 0\cdot4\xi^2$; the positive or negative sign being taken according as we are dealing

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[16] *Chances of Death*, p. 68 *et seq.*

with the right or left branch. This operator reaches its maximum when $0.4\xi - 2.2 = 0$, or $\xi = 5.5$. Substituting this value in the expression, we find for the furthest distance from the median which can be reached about 12, that is twelve-tenths-of-an-inch above three hundred-tenths of an inch, or about 32, a result which is very nearly the same as that which Professor Pearson has adopted.

I should not expect so close an agreement in cases where, on the strength of his hypothesis, in order to round off the representative curve, he has added or subtracted observations at the extremity. I should hesitate to accept his inference of *antenatal*[17] deaths without having ascertained that the mortality statistics of infancy would not fit a unilateral curve[18] constructed as above on the hypothesis of translation. It would also be surprising if the statistics of fecundity could not be fitted without manipulation to a *translated* probability-curve. Professor Pearson proposes to omit about half the observed number of sterile marriages as not homogeneous material, but " owing to causes other than those which naturally determine the distribution of fertility in man,"[19] because the observed number of families with no children exceeds the number which his formula requires. The sort of hump which the uncorrected ordinate at zero would make is indeed quite inconsistent with his generalised probability-curve. But that sort of hump is quite consistent with our generalised method of translation. The only wonder is that it should not always occur, for instance in the statistics of divorces above considered.[20] The explanation that the rise of the ordinate to infinity at the initial point is masked by the rough graduation, the discontinuity, of the concrete statistics is certainly not of universal application. However it is quite possible that if the representation of the statistics of fecundity which I have above indicated were completed, Professor Pearson's conclusions would be borne out as to their quality at least, if not their quantity.

In directing these criticisms against the highest authority on the subject, I ought to explain that they touch only the more speculative parts of his system, concerning which perfect unanimity was not to be expected. His *mathematical* contributions to the theory of evolution are above criticism. I ought also to acknowledge the assistance which I have derived from the statistics which Professor Pearson has collected and the work which he has performed on them. To employ his calculations in a controversy with himself is to shoot at the eagle with the aid of his own plumes.

To conclude, it has been maintained that there is an essential difference between the formulæ which have not and those which have an *à priori* basis. They are as opposite as night and day; yet, as night insensibly passes into day, so it is impossible to fix

[17] *Philosophical Transactions*, 1895 A.

[18] Above, p. 544.

[19] *Chances of Death*, p. 77.

[20] P. 542, and *cp.* Appendix, Note 6, Part I.

the point at which the presumptions of deductive reasoning become effective. The deepest darkness shrouds the origin of these strange shapes which, as pointed out by Professor Pearson, are presented by the statistics of *cloudiness* and *consumptivity*. Nor has much light been shed on the more familiar unilateral or continually descending curve which is presented by many botanical, economical, and other kinds of frequency-curves. Perhaps they have nothing to do with the law of error; perhaps they are deducible from some other less universal, yet still very general, principle, such as the law of "cooling" or defluxion, whether in its simple form, or complicated, as in Gompertz's law of mortality.

The dawn has begun to appear when we pass to two-sided, though still very asymmetrical, frequency-curves. As an illustration of this twilight of hypothesis, between the being and not-being of a *vera causa* we might consider the statistics representing the frequency of different amounts of income. If we confine attention to the amounts on which income tax is paid, in this country at least,[21] we shall have a unilateral curve of frequency. But if we take in the income of the wage-earning classes, we obtain, as appears from the report on the wages of manual labour by Sir Robert Giffen,[22] a branch ascending to a maximum as we move from the lowest to the higher incomes. Ought we to treat the completed set of income statistics as material for a comprehensive formula? There is much to be said for the procedure which Professor Pareto has adopted with brilliant success: finding a simple formula which fits the descending right hand branch of the given group most accurately. On the other hand, it is natural to wish to treat the whole group of incomes, the lower with the higher, as what Professor Pearson would call "homogeneous material." But for *this* purpose it would be better, I think, to define income as what a man wins in *economic* ways, not as Professor Pareto has defined it, quite properly for *his* purpose, so as to include "la somme des biens dont jouit un homme," whether obtained by work or charity.[23] If we consider the total group of incomes, it clearly does not conform to the probability-curve: Professor Pareto has shown this convincingly.[24] And yet, after all, there may be something in the hypothesis which he combats—that of Dr. Otto Ammon. Income does not vary according to the normal law of error, but it may be *dependent* on some attribute which does so vary, to wit, *ability*, as Dr. Ammon has suggested. Thus the frequency of *incomes* might form a *translated* probability-curve of the sort which we have illustrated by divorce statistics.

Two formulæ offer themselves[25] as proper to represent this sort of asymmetrical grouping, the Pearsonian binomial and the

[21] In some foreign States the frequency of tax-paying incomes presents a *bilateral* curve.

[22] As pointed out by the present writer in the *Economic Journal*, 1895, p. 673.

[23] *Cours d'Économie Politique,* sec. 961 ; *Journal de la Société de Statistique, Paris*, 1897, p. 376.

[24] *Cours* . . . sec. 963.

[25] *E.g.*, in the case of the *divorces* cited above, p. 542.

translated probability-curve. The hypothesis on which these methods rest may well appear to the impartial theorist equally, that is about half, true, to the practical statistician equally, that is not very, useful.

The truth and the usefulness increase as we approach the precincts of the day, the light of the normal law of frequency. The method of translation now acquires the attribute "proper," the use of squares and curves to replace an unknown function now is justified by a probable hypothesis. The Pearsonian binomial becomes now identified with the normal law of frequency, the genuine probability-curve. That is understanding the normal law of frequency to include not only the familiar symmetrical law of

error, viz. (1) $y = \dfrac{1}{\sqrt{\pi c}}\, e^{-\frac{x^2}{c^2}}$, but also what I have called the

asymmetrical probability-curve,[26] viz.:—

$$(2) \quad y = \frac{1}{\sqrt{\pi c}}\, e^{-\frac{x^2}{c^2}}\left[1 - \frac{2j}{(2\mu_2)^{\frac{3}{2}}}\left(\frac{x}{c} - \frac{2x}{3c^3}\right)\right];$$

and not only that, but a *third*, and if desired a *further* approximation to the result of numerous independent agencies co-operating. I submit that in contemporary scientific literature an improper distinction is often drawn between the cases where the contributory causes or elements are symmetrical in their variations, as the number of heads obtained by tossing n coins, or unsymmetrical, as the frequency with which a certain face is obtained when a teetotum is spun n times. When the elements are unsymmetrical the symmetric law above labelled (1) holds as a first approximation, not so well, of course, not to the same distance from the centre as a further approximation, in particular the one labelled (2). When the elements are symmetrical, law (1) is still but a first approximation, holds not so well, not to the same distance from the centre as a further approximation, not indeed (2), which now reduces to (1), but the *third* approximation above alluded to, which involves *fourth* powers of the abscissa as a variable, and the mean *fourth* powers of the observations as a constant. Add that in general we should consider concrete fluctuating phenomena, *e.g.*, human statures, as made up not of *sums* but *functions* of contributory elements; and, functions not being in general symmetrical, even if the elements varied symmetrically, the compound would vary according to an unsymmetrical probability-curve.[27] The suggestion now frequently to be met with, that the law of Quetelet, or more truly of Laplace and Poisson, is superseded, because it has been found that in fact concrete groups are very generally to some extent asymmetrical, appears to me quite misleading. On the hypothesis from which the normal law

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[26] *Philosophical Magazine*, 1896.
[27] *Cp.* Note 4 to Appendix, Part I.

of frequency is deducible some degree of asymmetry[28] is to be expected; it does not destroy but fulfils the hypothesis.

On the confines of the normal law of frequency thus understood appears, along with the Pearsonian binomial and the translated probability-curve, one more competitor for the representation of frequency-statistics, the Pearsonian method of separation. It must be admitted that there is a great weight of *à priori* evidence in favour of this construction. To the references given in my first part should be added several instances of groups actually formed under our eyes by the collocation of diverse types of flowers, shown by Dr. Ludwig and other eminent botanists.[29] But though the evidence that actual groups are separable into several normal curves is very strong, the separation into *two* normal curves, the only practical proposal as a general treatment, is not equally supported by *à priori* evidence; and it certainly cannot be recommended on the ground of facility. As a general method therefore, apart from special presumption in favour of dichotomy, this method does not seem advisable.

Something turns however on the relation of this method to the normal principle: on the nice question which I have elsewhere attempted to answer,[30] how it comes to pass that a total group which can be split up into several normal groups with different centres, yet as a whole presents the appearance of a normal (almost a symmetrical) group?

A similar difficulty is raised by the method of translation. It may be regarded as a peculiar case[31] of the general asymmetrical probability-curve, and yet both seem to fit some cases which I have examined equally well.

It may be well to illustrate the fit of the asymmetric probability-curve. A summary test is afforded by comparing one of the moments, viz., the mean-cube-of-error, as (1) obtained by *percentiles* (with certain other data) on the hypothesis that the asymmetric probability-curve above written holds good, and (2) given by actual observation. There is a very simple method of determining j, the mean-cube-of-error, from that formula, when we are given the position of the centre of gravity, the origin of x, and also c ($=\sqrt{2\mu_2}$ in Professor Pearson's notation). The expression for the area measured from the origin generally involves x somewhat troublesomely (in the index of the constant e). But there is one value of x at which the expression for the area is clear of this complication, namely, $x = c \div \sqrt{2}$ or $(\sqrt{\mu_2})$. The area

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[28] Say up to the limit where the mean curve of error referred to the modulus as unit, *i.e.*, $j \div c^{\frac{3}{2}}$, does not exceed one-seventh—though of course no exact limit can be fixed.

[29] See in particular *Botanisches Centralblatt, Variationskurve,* 1895.

[30] *Journal of the Royal Statistical Society,* 1898, p. 542.

[31] The case in which the second term of expansion given in our Appendix, Note 4, Part I, instead of being as in general ellipsoidal—to use the language of three dimensions—breaks up into two *planes*. The difficulty is not entirely removed by remarking that in the most general form of the method of *translation* the generating curve should be regarded as an *asymmetrical* probability-curve.

intercepted between the centre of gravity and the point at that distance above the centre of gravity (j being taken as positive) $= \frac{1}{2}\theta(\sqrt{\mu_2}) - \dfrac{1}{3\sqrt{\pi}}\, j$, where θ is the integral of the error-function tabulated in the books. By parity the area between the centre of gravity and that distance *below* the centre of gravity is $\frac{1}{2}\theta(\sqrt{\mu_2}) + \dfrac{1}{3\sqrt{\pi}}\, j$. Thus the difference between the two intercepts of area, which we will call D, $= \dfrac{2}{3\sqrt{\pi}}\, j$. Whence

$$j = \frac{3}{2\sqrt{\pi}}\, D = 2\cdot 66\, D. \qquad \frac{3\sqrt{\pi}}{2} \quad \text{\small See Vol. 73}$$

$$\text{\small p. 81}$$

Take for example some of the statistics of barometric height given by Professor Pearson in his paper on that subject.[32] Totting up the horizontal rows in which he has distributed the frequency of barometric heights at Churchstoke, I obtain the annexed data

TABLE VIII.—*Variations of Barometric Pressure at Churchstoke.*

Tenths of an Inch.	Number of Days.	Tenths of an Inch.	Number of Days.	Tenths of an Inch.	Number of Days.
310	1·0	301	336·5	293	55·5
309	2·0	300	329·5	292	33·0
308	6·0	299	281·5	291	23·0
307	37·0	298	269·5	290	11·0
306	68·0	297	253·0	289	7·5
305	99·0	296	181·5	288	4·5
304	152·5	295	137·5	287	1·5
303	214·5	294	89·5	286	1·5
302	279·0				

for the variation at Churchstoke. From Professor Pearson's tables we have for the centre of gravity of this group 299·545 (tenths of an inch), for the mean square of deviation 12·6642, for the mean-cube-of-error 15·9835; the total number of observations being 2,921. Measuring 3·558 ($= \sqrt{12\cdot6642}$) from 299·545 *downwards*, or towards the *higher* pressures, I find (by the usual simple intercalation) that there are comprised between 299·545 and (299·545 + 3·558) 1058·87. Also between 299·545 and (299·545 − 3·558) I find 911·94 observations. As 1058·87 − 911·94 = 146·93, we have for the difference of areas, D, 146·93 ÷ 2,921 = 0·05; and for $j \div c^{\frac{3}{2}}$ 0·05 × 2·66 = 1·3. Which calculation agrees nearly with observation; since $j = 15\cdot9835$ and $c^2 = 2 \times 12\cdot6642$. Whence $j \div c^{\frac{3}{2}} = 1\cdot2$ nearly.

Similarly for the Babbacombe statistics tabulated after Professor Pearson in our Part I,[33] I find for the excess of observations below the centre of gravity 136·36, for the defect above the centre

[32] *Philosophical Transactions*, p. 452.

[33] *Journal of the Royal Statistical Society*, 1898.

of gravity 117·42. The difference, 18·94, divided by the total number of observations, here 365, gives, as before, 0·05 for D; which, multiplied by 2·66, gives 0·13 for $j \div c^{\frac{3}{2}}$; which agrees exactly with observation, since

$$j = 13·0321, \quad c^2 = 2 \times 10·901, \quad j \div c^{\frac{3}{2}} = 0·13.$$

Similarly for the statistics of American schoolgirls given by Professor Pearson in his second *Contribution*,[34] I find, for the excess of observations below the centre of gravity 753·30, for the defect in the upper branch 716·54. Whence, the total number of observations being 2,192, we have D=0·017; and D × 2·66=0·045, for $j \div c^{\frac{3}{2}}$. Which agrees exactly with observation, since

$$j = 2·38064, \quad c^2 = 2 \times 7·0739, \quad j \div c^{\frac{3}{2}} = 0·045.$$

It will be seen that the coefficients of the asymmetric probability-curve can be determined without the trouble of finding the mean cube of error by direct observation. The trouble of applying the constants to calculate the frequencies for each degree of the phenomenon under measurement is about the same, I think, as that which attends the application of the Pearsonian binomial or our method of translation.[35]

The question now remains: if these three formulæ, the Pearsonian binomial, the method of translation, and the asymmetrical probability-curve, about equally well fit the observations, in case of moderate asymmetry, which should we adopt? I am disposed to give the preference to the probability-curve, on the ground of its universality. I regard the normal law of frequency as ever tending to be set up throughout all nature—and almost beyond her bounds if we may conceive with some metaphysicians a region in which aggregate phenomena show statistical uniformity, while the individual events are arbitrary and lawless.[36] Alone or best of propositions outside pure mathematics the law of error realises the antique ideal of science, as deducible from universal necessary axioms. Such—or as nearly such as modern physical science will accept—is the character of the principles on which the law of error mainly rests: first, the principle that of interdependent quantities a small change in the one is *proportionate* to a small change in the other, or whatever is the most philosophical statement of Taylor's theorem; and, secondly, the principle that there exist phenomena *independent* of each other, or whatever is the most philosophical statement of Laplace's third principle of probability.[37]

[34] *Philosophical Transactions*, 1895 A, Ex. 4, p. 386.

[35] The area of the asymmetric probability-curve can be expressed by the well-known integral of the error-function together with terms of the forms qe^{-x^2} and $qx^2 e^{-x^2}$, where q is a constant and x is the variable measured from the centre of gravity.

[36] *Cp.* Renouvier, *Essais Critiques,* I, *sub voce* Probabilité.

[37] "Si les événements sont indépendans les uns des autres, la probabilité de l'existence de leur ensemble, est le produit de leurs probabilités particulières."— *Essai philosophique sur les Probabilités.*

I regard this as what Mill describes with respect to mathematics as a definition, implying the existence of the thing defined. (*Logic* I, viii, 5.)

There are some who hold that these principles—as there are some who hold that even mathematical axioms—are given not indeed intuitively but by a wide continual almost unconscious perhaps hereditary experience. At any rate they are not empirical in a restricted sense; at any rate they have the highest degree of generality. The Greeks, says Mr. Galton, if they had known of the law of error, would have personified and deified it; the moderns should at least respect it as the most universal law of nature.

APPENDIX.

Note 16.

On the Determination of the Constants in the Generalised Method of Translation.

The method rests on the hypothesis that the given group is formed out of a group conforming to the symmetrical probability-curve, by substituting for each member of the latter group some *function* thereof.

The problem presents two stages, (I) the first, and (II) the further approximation : and under each head we may consider two classes of cases roughly demarcated by (1) the presence, or (2) the absence of one or more of several more or less connected attributes ; namely, that the distance α should be considerably above unity; that the portion of the original curve folded over or turned down by the transformation should not be considerable; that the element which was originally at the median should continue after the transformation to be the median (not deprived of that character by the tail being turned back so as to reach beyond the middle of the body); that the transformed curve should retain the original shape, so far as to have two sides or branches and one maximum; that the function may be expanded in ascending powers of the deviation from the mean of the original group, and that we may neglect powers above the third.

I.

(1.) The problem may be stated thus : to find the position on the abscissa of o, the centre of a symmetrical probability-curve with unit modulus, and α, the distance from o of a certain origin w, such that x being the distance of any element of the probability curve from w, if the group is transformed by putting $X = f x^2 + k x^3$, the new curve in X will correspond to the given group. If the median element retains its character, we may take the observed median as origin, and, supposing a symmetrical probability-curve to be placed with its centre at that point, transpose each element at distance ξ from that origin by putting $x = i \xi + j \xi^2 + k \xi^3$. Here i, j, k are constants, of which the values in terms of α, f, k may be obtained by expanding the above written expression for X. It appears from the expansion that the

absolute magnitude of X will be a maximum at a distance α to the left of the new origin (the median of the actual group) and also at another distance α', which affords an alternative or conjugate construction for the given group. In general, in order that the construction should belong to class I, α' as well as α, should be considerable. For they are both roots of the quadratic $\dfrac{dx}{d\xi} = 0$, which may be written, if A is put for $i \div 3k$, and B for $j \div 3k$, $3k\,(x^2 + 2Bx + A)$; and this expression enters as a denominator into y, the ordinate of the transformed curve. If x is taken to represent the absolute distance on either side of the origin (the median), the above statement requires to be modified for the part of the curve left of the origin by changing B to $-$ B (as noticed in the text).

With this convention the equation of the transformed curve becomes $y = \dfrac{1}{\sqrt{\pi}}\, e^{-\xi^2}\dfrac{d\xi}{dx}$, where for ξ is to be substituted its value in terms of x (derived from the equation $x = i\xi \pm j\xi^2 + k\xi^3$).

Whence $y = \dfrac{1}{\sqrt{\pi}} e^{-\xi^2} \div \dfrac{dx}{d\xi} = \dfrac{1}{\sqrt{\pi}} e^{-\xi^2} \div 3k(A \pm 2B\xi + \xi^2)$, there being substituted for ξ its value in x.

This expression assists us in obtaining trial values of A and B when we have observed the approximate position of the mode. For at the mode $\dfrac{dy}{dx} = 0 = y \times \dfrac{-2}{3k}\,\dfrac{\xi^3 - 2B\xi^2 + (A+1)\xi - B}{A - 2B\xi + \xi^2}$, for the left branch of the curve. If then the mode is at the distance β, to the left (as likely), from the median, we may expect that

$$\beta^3 - 2B\beta^2 + (A+1)\beta - B = 0.$$
$$A = [B(2\beta^2 + 1) - (\beta^3 + \beta)] \div \beta.$$

Substituting this value of A in the quadratic of which α is a root, we have $B = \beta\,(\alpha^2 - (1+\beta^2)) \div (2\alpha\beta - (2\beta^2 + 1))$; an expression which assists us to conjecture the value of B for any given value of β. For instance if $\beta = 0{\cdot}6$, as seems to be the case for the statistics of divorce discussed in the text, if α is to be over $1{\cdot}4\overset{.}{3}$, B must be positive in the expression for the *right* branch of the curve ($-$ B in the left branch, a negative quantity). Taking $\alpha = 1{\cdot}6$ we obtain, as stated in the text, very plausible values for A and B.

We might also obtain a less plausible, *negative* value of B for smaller values of α. On the understanding that each branch is still to be treated as (initially) positive, this would give us, for the right-hand branch—

$$x = (A\xi + B\xi^2 - \tfrac{1}{3}\xi^3)\,3k,$$

and, for the left-hand branch—

$$x = (A\xi - B\xi^2 - \tfrac{1}{3}\xi^3)\,3k.$$

By parity of reasoning, on the assumption that $\beta = 0.5$, for this construction α may be between $\sqrt{1.25}$ and 1.5. For a rough approximation on these lines, I find $A = 2.2$, $B = 0.31\dot{6}$ (in absolute magnitude).

If $\beta = 0.25$, as approximately in the case of the statistics of fecundity cited in the text, for values of α above 1.03 (and below 2.25), the value of B, and accordingly that of k, is negative, with the result stated in the text.

It must not be supposed that the solution lies always so much on the surface. But the method is of great flexibility; and we may fit some concrete cases by supposing that the quadratic $x^2 \pm 2Bx + A$ has either one root zero, or both roots equal. Sometimes we may employ the property that the ordinate becomes infinite when $x = \alpha$; sometimes we may be able to attach a physical meaning to the supposition that α is imaginary, and y never becomes infinite.

When the given curve has no maximum ordinate, we must fall back on the use of equations illustrated in the text (p. 544).

(2.) We must proceed even more tentatively when the transformed curve is greatly distorted. It is no disparagement to the general hypothesis that any particular case cannot be fitted to formula (1); it may well be that the *function* proper to the case does not admit of being expanded in ascending powers of the variable.

II.

(1.) To obtain a further approximation in the case where there is a turn-down, but not a considerable one, let n_r be the given number of observations between two consecutive degrees on the abscissa, measured from the median, say to the left. To find the value of ξ_r corresponding to x_r, we have the equation $i\xi - j\xi^2 + k\xi^3 = x_r$, which may have, corresponding to x_r, *two* roots in the case of a simple "turn-down," such as that instanced on p. 541. Call those roots ξ_r and ξ'_{r+1}. Then, remembering that ξ_{r+1} was *nearer* the centre of the probability-curve before the tail in which that value of ξ occurs was turned back, we have $n_r = \frac{1}{2}[\theta(\xi_{r+1}) - \theta(\xi_r)] - \frac{1}{2}[\theta(\xi'_{r+1}) - \theta(\xi'_r)]$, where θ is the integral of the error-function. From this equation the arithmetical values of $\dfrac{dn_r}{di}$, $\dfrac{dn_r}{dj}$, and $\dfrac{dn_r}{dk}$ can be ascertained; as the differential of θ is the error-function, and

$$\frac{d\xi_r}{di} = -\frac{dx_r}{di} \div \frac{dx_r}{d\xi_r} = -\xi_r \div (i - 2j\xi_r + 3k\xi^2_r),$$

with analogous expressions for $\dfrac{d\xi_r}{dj}$ and $\dfrac{d\xi_r}{dk}$, and for the differentials of ξ_{r+1}, &c. In short we thus obtain an equation of the form $L_r \Delta i + M_r \Delta j + N_r \Delta k = \delta n_r$, where L_r, M_r, N_r are numerical coefficients; and δn_r is the observed error on n_1 incident to the first approximation. By parity we obtain linear equations for Δi, Δj, Δk from all the other values of n. From these numerous

equations the most probable values of Δi, Δj, Δk are to be found, and added to i, j, k; after which the process may be repeated.

In applying the method of least squares to find the best values of i, j, k, we meet with the difficulty that the *weight* of all the equations is not the same. In view of this difficulty there is a peculiar propriety in the use here of a certain substitute for the method of least squares which I have elsewhere proposed.[38] We have agreed (after Professor Pearson) to take as the measure of the fit of a representative curve the difference between the observed and calculated area taken positively or in absolute quantity. To secure the best possible fit so understood, we have only to take Δi, Δj, and Δk so as to make $\Sigma \delta n_r$ as small as possible, every δn being taken positively. This is a particular—a specially weighted—case of the generalised "method of situation" to which I have referred.

The labour of the solution may be lightened if we can eliminate one of the three unknown quantities Δi, Δj, Δk by means of an equation connecting i, j, and k. Such an equation may be afforded by the mean first power of error, measured in the *positive* direction *only*, from the *median*, which may be shown to be equal to—

$$\frac{1}{2\sqrt{\pi}}i + \frac{1}{4}j + \frac{1}{2\sqrt{\pi}}k.$$

Of course, where the turn-down is inconsiderable, as in the case of the statistics of *fecundity* cited in the text, the system of equations for i, j, k becomes mostly or altogether linear.

(2.) In the cases far removed from the law of error there are fewer linear equations, and there are *four* unknown quantities. The labour of applying the formal method of approximation in these cases would be out of proportion to the worth of the result.

II.—*The Statistics of Wages in the United Kingdom during the last Hundred Years.* (Part IV.) *Agricultural Wages*—Concluded. *Earnings and General Averages.* By A. L. BOWLEY, M.A.

BEFORE forming general index numbers for agricultural wages in the United Kingdom, it is necessary to discuss the relation of total earnings to nominal weekly wages. As has already been pointed out, the agricultural labourer earns at different rates in different seasons, and increases his nominal wages by special payments at hay harvest and at corn harvest, and in some cases by task work. There are apparently only five general estimates of the average addition thus made to wages. Arthur Young stated separately the rates for corn harvest, for hay harvest, and for winter, including a valuation of all food and drink given by the employer, and then, assuming that the harvest rate (average 11s. 5d. per week) was paid for five weeks, the hay rate (9s. 7d.) for six weeks, and the winter rate (6s. 7d.) for the remaining

forty-one weeks, calculated the "medium" for each place visited. The average for all is thus 7s. 5d. per week, or 19l. per annum. I have made a slightly different assumption, viz., that the winter rate lasted only twenty-nine weeks, and that an intermediate rate (8s.) was paid between the hay and corn harvests for twelve weeks. The general average then is 7s. 9d. per week, or 20l. per annum. Notice that this 7s. 9d. is 18 per cent. more than the general or winter rate, 6s. 7d.

In the report of the Labour Commission of 1894,[39] Mr. Little gives very complete and careful estimates, county by county, of nominal weekly wages and of average weekly earnings, if extra payments are supposed, distributed equally through the year. The calculation is done for 1867-70 and 1892. At the earlier date "wages" averaged 12s. 4d., earnings 14s. 2d., i.e., 15 per cent. more; at the later date the averages were 13s. 5d. and 15s. 6d., the difference here being practically the same, 15·5 per cent.

Mr. Kebbel (in the *Agricultural Labourer*, 1893) gives estimates for several counties in 1887 (*circa*); the differences he finds show an average of 28 per cent.; much of this is due to a large estimate for task work, which, judging from Mr. Little's figures, falls to the lot of the exceptionally good labourer rather than to the average man. Dr. Rhodes (*Manchester Statistical Society's Journal*, 1890) holds that the earnings as stated by Mr. Kebbel, and, I believe, quoted by Major Craigie to the Farmers' Club,[40] are the highest that could be earned at the dates in question, and do not represent the average. Similar remarks, perhaps, apply to figures given by Mr. Kebbel which relate to a farm in Hampshire (1845-69), where an excess of 50 per cent. of earnings over wages is found; but Mr. Little also finds a difference of over 30 per cent. for this county. Under these circumstances it seems reasonable to adopt Mr. Little's figures for the general average. I have found only twenty or thirty other estimates which can be compared with these general calculations, and they relate to different counties at dates scattered from 1773 to 1867. Averaging these in periods, I find a difference between wages and earnings of 11 per cent. before 1827, of 20 per cent. between 1834 and 1867, and 23 per cent. in 1872-74. The great difficulty is usually to find what allowance should be made for reduced rent. Looking at the question generally, there seems no reason to suppose that the ratio of earnings to wages has changed to any great extent on the average since Arthur Young's time, and it appears that the former are about 17 per cent. higher than the latter.

There remains the investigation of 1833, when circulars were addressed to about one thousand parishes in various counties, asking, among other questions, for the normal summer and winter wages, distinguishing between the rates when beer was and when it was not given, and also asking, "What might an average labourer with average employment earn in a year, including harvest work

[39] C–6894, xxiv and xxv.

[40] I have not traced this reference; but the figures criticised by Dr. Rhodes are substantially the same as Mr. Kebbel's.

and the whole of his advantages and means of living?" The answers printed yield the following averages :—

Weekly Wages and Earnings in 1833.

		s.	d.					s.	d.
Wages	Summer....	11	2	; or, valuing beer when given........				11	4
	Winter	10	6	,,	,,	,,	....	10	8
Earnings	....	10	9	,,	,,	,,	....	11	—

In brief, earnings are calculated to be equal to the average of summer and winter wages, instead of some 10 to 20 per cent. in excess, as we might expect. From a study of the answers, I am inclined to think that the column showing annual earnings is of little statistical value. The authorities who filled in the forms were ignorant of the niceties of calculation, and it is clear that in many cases they omitted money payments of importance, and it may be presumed that they did not make accurate allowance for free cottages and free haulage, for wheat and milk below market price, and the numerous other items which swell the labourer's income. It is possible, however, that an allowance was made in the estimates of earnings for the great dearth of employment in the winter, which would account for the discrepancy; this gives rise to a problem which will be discussed immediately in relation to the condition of the Irish at the same date.

It is clear that the materials for exact determination of this ratio are not extant; and in the absence of evidence to the contrary, we must adopt the provisional conclusion that the ratio has not changed greatly during the period we are dealing with, and that therefore the index numbers found for wages can be adopted for earnings without alteration, but with considerable loss of precision. The following imaginary budget of a labourer's receipts may be regarded as typical of the data on which the preceding calculations are based. It applies, I think, to many counties, and (with proportional changes in the amounts) to many dates :—

	s.					£	s.
Winter wages	9	for	30	weeks	....	13	10
Summer ,, ...	11	,,	15	,,	....	8	5
Hay harvest	13	,,	2	,,	....	1	6
Corn ,, ...	21	,,	5	,,	....	5	5
Task work makes up for time lost in bad weather, and yields in addition						1	—
Cheap rent, free beer, and smaller perquisites, not already included						1	6
Annual income						30	12

Equivalent to 11s. 9d. per week.

Average of summer and winter weekly rates ....   — 10

Excess of weekly earnings over wages, 1s. 9d., or 17 per cent.

As regards Scotland, the index numbers already calculated apply without change to earnings, for all perquisites have already been included.

We meet with our greatest difficulty in the case of Ireland. The statements as to earnings may be recapitulated from the former paper (June, 1899). Young's figures for 1777 show an average of 3*s.* 6*d.* per week "the year round," no distinction being made between nominal wage and actual earnings. Drummond in 1837 (*circa*) gives the wages as 4*s.* 6*d.*, but the earnings as only 2*s.* 3*d.* Professor Baldwin in 1881 states the earnings as 7*s.*, while the wage appears to be 9*s.* In the Reports of the Labour Commission earnings are on an average estimated at 9*s.* 8*d.*, wages at 9*s.* 5*d.* The only other information found is that extracted from the *Statistical Account of Meath*, 1802, *loc. cit.* There it appears that the cottier and bound-labourer worked the whole year, while the out-labourer obtained wages only on one hundred and fifty days. Grouping the three classes together, a very rough estimate gives four-fifths of the year as the average time in which work could be obtained. The following table satisfies all the conditions:—

Year.	Nominal Weekly Wage.		Assumed Fraction of the Year during which Work was Obtained.	Average Weekly Earnings.	
	s.	*d.*		*s.*	*d.*
1777	3	6	1	3	6
1802	5	1	$\frac{4}{5}$	4	—
'29	5	1	$\frac{3}{5}$	3	—
'37	4	6	$\frac{1}{2}$	2	3
'45	4	8	$\frac{1}{2}$	2	4
'50	4	10	$\frac{1}{2}$	2	5
'62	7	2	$\frac{7}{12}$	4	2
'70	7	10	$\frac{2}{3}$	5	3
'80	9	—	$\frac{7}{9}$	7	—
'86	9	4	$\frac{8}{9}$	8	4
'93	9	5	$\frac{40}{39}$	9	8
'94	9	9	$\frac{40}{39}$	10	—

The fractions not already discussed are interpolated on the assumption of uniform change, except that Drummond's low estimate for 1833-40 is assumed to apply till 1850, up to which date there seems to have been little improvement. The fractions applied since 1845 are consistent with Mr. W. P. O'Brien's evidence already discussed (*loc. cit.*). The whole calculation is very rough, and is only given for want of a better method. Both sets of index numbers are used, and distinguished in the sequel, and the effect of their divergence is shown in the table (p. 562, *et seq.*) and diagram between pp. 558 and 559, so that it will be easy to allow for the alteration if any better estimate is forthcoming.

Having thus established index numbers of various degrees of precision for certain fixed dates, which I will call pivot dates, the next step is to interpolate figures for intermediate years. The plan of interpolation must be such that all indications of station-ariness or change, or rates of change found in the data for various counties must be allowed some effect, that a single or unsupported

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DIAGRAM SHOWING ANNUAL EARNINGS OF AGRICULTURAL LABOURERS, (ADULT MALES)
YEAR BY YEAR SINCE 1770, DISTINGUISHING ENGLAND, SCOTLAND AND IRELAND AND
INDICATING THE METHODS AND RESULTS OF INTERPOLATION.

x   Calculated directly in previous papers.
———   From subsidiary evidence.
....   Interpolated by comparison with English figures.
~~~~~   Interpolated on hypothesis of uniform change.
- - - -   General average for United Kingdom.

HARRISON & SONS. LITH. ST MARTINS LANE, W.C.

figure must have no overwhelming effect on the general average,
and that the general maxima and minima must come at the right
dates. It would be tedious to give evidence for each interpolated
figure separately. The figures for England and Wales are based
on the county index numbers published in the December issue of
this *Journal*, 1898. In most cases there was little difficulty in
tracing the general course of wages from date to date. Thus
from 1770-88 there is little evidence of change; in 1788 a rise
commenced, which culminated in the period 1806-12; but the date
of the maximum and the extent of the fluctuations in those seven
years are not certain. About 1812 a fall set in, which was
accelerated in 1820-21, and reached its lowest point in 1824; till
1852 no great change is registered, but weekly wages fluctuated
between 9s. 6d. and 10s. 6d. A very rapid rise took place during
the Crimean War, part of which was lost in 1857-58, and some
recovered in 1859-60. Wages were stationary till about 1866,
when a rise began slowly, was greatly accelerated in 1870-73, and
culminated in 1874; but the dates and heights of the maxima in
the fifties and the seventies cannot be exactly determined. The
ensuing fall appears to have set in regularly in 1877 and continued
till 1886; after which a slow recovery followed till 1892. The
reader must be referred to the varieties of type used in the county
index numbers for guidance as to the accuracy to be expected in
these interpolated figures. As a rough clue I should suggest that
the county rates are as likely as not to be 6d. in error for the pivot
dates; if we may apply the theory of error, it would follow that
the "probable error" in each pivot index number is less than one;
and that the precision to be found in comparison of index numbers
for two years is greater when the authorities for the dates in
question are similar, less when they are different. For the inter-
polated figures the probable error to be added to that of the pivot
numbers is to be found by making different hypotheses for inter-
polation and comparing the results. I should judge that, except
for the doubtful periods named, the interpolated index numbers
are more likely than not to be within three of the fact; *e.g.*, the
calculated number for 1865 is 88; I should judge it more likely
than not that the true number is between 85 and 91. All these
calculations as to precision, however, are to be regarded as tenta-
tive. The index numbers adopted are given in Col. A *a* of the
following table; the pivot numbers being printed in heavy type.

Since there is some doubt with regard to most of the informa-
tion used as to the exact year to which it refers (for a statement
printed, *e.g.*, in 1840 may refer to 1838, 1839, or 1840), I have
smoothed the figures by placing against each year the number
obtained by averaging the index numbers of that year, the pre-
ceding year, and the following year. This has the effect of
diminishing the influence of isolated statements, and allowing the
great inertia of a mass of wages some influence in steadying the
numbers. These figures are given in Col. A *b*, and are used in
the sequel.

The interpolation for Scotland has been carried out on a
different plan. The index numbers of the ten districts given in

the last table in Part II (March, 1899) are not always sufficient
for the purpose, and attention has been paid to the course of
wages in England. For years in which direct evidence could be
found for Scotland, the English figures are not used. When the
pivot numbers for Scotland showed that wages in the two countries
had followed different courses, uniform progress or retrogression
was assumed in Scotland, in the absence of evidence to the contrary.
It may be noticed that the ratio of the wages in 1814 (*circa*) and
1833-40 is the same in both countries; figures for intermediate
years have been filled in on the assumption that the changes year
by year were also proportionate. Thus from 1770 to 1790 a
uniform rise is assumed to satisfy the Scotch figures; from 1790
to 1804 the English have been allowed some influence. From
1804 to 1834 the English rates of change are superimposed on the
Scotch pivot numbers. From 1834 to 1845 a uniform rate has
been assumed, giving figures whose average corresponds with the
pivot number found from the statistical accounts of that period.
From 1845 to 1878 the English changes are again superimposed
on the Scotch pivot numbers. From 1878 to 1892 the rates of
change in the two countries diverged, and a uniform fall and rise
has been assumed. The resulting index numbers are given in
Col. B *a*. Three-yearly averages are placed in Col. B *b*.

The Irish index numbers are formed on the same principles;
but in this case it has generally been necessary to assume station-
ariness or uniform change. The result agrees closely with the
only sequence of wages obtainable, those paid in a Limerick farm
between 1837 and 1885 (Irish Statistical Society, 1887). These
figures are given in Col. C *a*, and represent weekly wages; the
figures in Col. C *α* represent annual earnings, calculated on the
hypothesis as to want of employment already explained.

It is to be noticed that for those years in which the rates of
change in Scotland or Ireland are assumed to proceed *pari passu*
with those in England, on taking the average of the United
Kingdom it comes to the same thing as entirely neglecting informa-
tion as to Scotland and Ireland. The diagram shows in which
years the various methods have been followed; but of course in
many cases a blend of the three methods has been employed.

In taking the average for the United Kingdom, the total
weights (allowing both for numbers employed and rate of earning,
and therefore proportional to the total sums paid in wages) to be
assigned to the three countries are roughly 6 for England, 1 for
Scotland, and 3 for Ireland, varying of course during the century.
From this it follows that an error of about 10 in a Scotch index
number, or about 3 in one for Ireland, are necessary to make an
error of 1 in the general average. I should estimate that errors
for Scotland hardly affect the precision already suggested for the
English numbers, but that the greater liability to error in the Irish
numbers causes the precision of the average for the United
Kingdom to be only half that of the English; more exactly, the
calculated index number for the United Kingdom in 1868 being 77,
the true number is more likely than not to be between 72 and 82.
There is a further error, however, to be considered, viz., that due

to errors in "weighting" by the numbers employed. From 1841 onwards I have "weighted" by the census returns of agricultural labourers, and the changing weights (due chiefly to emigration from Ireland) have great effect, for the removal of a great body of the worst paid labourers accelerates the rate of increase of the average wage. The numbers used as weights are given in Cols. A *e*, B *e*, and C *e*. Thus 92 in Col. A *e*, for the year 1841, stands for the 920,000 adult male agricultural labourers in England and Wales at that date. I have not found the necessary information prior to 1841, and have had to assume that the proportion indicated by the 1841 census, 6 (England), 1 (Scotland), and 8 (Ireland), obtained from 1770 to 1841. This gives a lack of precision to the earlier index numbers (for the United Kingdom), which I am not able to estimate. Since 1841, however, we may apply the principle that errors in weight have far less effect on an average of any quantities than errors in the quantities themselves, and if the census returns are comparable the one with the other, we may expect that the precision already indicated is not altered. At this point, however, arises the question as to whether small Irish farmers, employing no labourers, should be included. The figures given are calculated from the numbers included as labourers in Mr. Booth's Paper in the *Statistical Journal*, vol. xlix, and farmers are excluded.

To conclude the explanation of the table. Cols. A *c*, B *c*, and C *c* and γ are calculated respectively from Cols. A *b*, B *b*, and C *a* and α. In the "*b*" and "*a*" columns the index numbers are formed with the base 100 in 1892 in each case.[41] On the other hand the bases in the "*c*" columns, viz., 108 in A *c*, 132 in B *c*, 67 in C *c* and γ, are chosen to satisfy the conditions that they shall be proportional to the average earnings in the three countries (viz., 40*l*. in England, 49*l*. in Scotland, 25*l*. in Ireland[42]), and that their weighted average shall be 100. These bases determined, all the other figures in the "*c*" columns are proportional to the corresponding figures in the "*b*" columns. The index numbers thus found are not only applicable to each country separately, but any figure in A *c* may be compared with any figure in B *c*, or C *c* or γ, or D *c* or γ. In fact one unit in these columns represents 7·41*s*. of annual earnings, or 1·7*d*. per week. For example, annual earnings in England in 1794, Scotland in 1815, and Ireland in 1892, were each equal to the average for the United Kingdom in 1853, the index number being 67 in each case. Cols. C, α, and γ and D, γ and δ are formed with allowance for irregularity of work in Ireland, as explained, and Cols. C, *a*, and *c* and D *c* on the basis of regular work. The "*d*" columns are simply the result of writing the "*b*" or "*c*" columns in £'s sterling, and show the actual earnings per annum. Notice that all the columns except these ("*d*") are independent of concrete sums and depend only on ratios. All figures in the table are calculated to the nearest integer.

[41] Except that in A *b* the process of averaging three years has reduced the base to 99.

[42] Based on the Labour Commission Reports.

These index numbers make no allowance for changes in the purchasing power of money, and except in the case of Ireland, assume that there has been no change in loss of wages through unemployment; and they take no account of women's or children's earnings.

The column D γ contains the index numbers for agriculture, the first line necessary for the formation of a series of general wage index numbers; the final column D δ is based on the whole mass of information readily accessible as to agricultural wages, and it may hoped show average agricultural earnings year by year with fair accuracy.

Index Numbers for Agricultural Earnings Year by Year.

| Years. | A. ENGLAND AND WALES. | | | | | B. SCOTLAND. | | | | |
	a. Index Numbers; Base 1892 = 100.	*b.* Index Numbers; Three-Yearly Averages.	*c.* Col. *b* with Base 1892 = 108.	*d.* Col. *b*, Reduced to £ sterling; Annual Earnings.	*e.* Weights Employed for General Average.	*a.* Index Numbers; Base 1892 = 100.	*b.* Index Numbers; Three-Yearly Averages.	*c.* Col. *b* with Base 1892 = 132.	*d.* Col. *b*, Reduced to £ sterling; Annual Earnings.	*e.* Weights Employed for General Average.
				£		18 in 1770, rising regularly to		24	£ 9	I
1770–88	50	50	55	20	6					
'89	51	51	56	21	,,					
1790	52	52	57	21	6	31	31	41	15	I
'91	54	54	59	22	,,	31	31	41	15	,,
'92	56	56	61	23	,,	32	32	42	16	,,
'93	58	58	63	23	,,	32	32	42	16	,,
'94	60	61	67	25	,,	33	33	44	16	,,
'95	66	66	72	27	,,	35	35	46	17	,,
'96	72	71	77	29	,,	37	37	49	18	,,
'97	74	74	81	30	,,	38	38	50	19	,,
'98	77	77	84	31	,,	39	39	51	19	,,
'99	79	79	86	32	,,	40	40	53	20	,,
1800	81	81	88	33	6	41	41	54	20	I
'01	83	83	91	33	,,	42	42	55	21	,,
'02	84	84	92	34	,,	43	43	57	21	,,
'03	85	87	95	35	,,	44	45	59	22	,,
'04	92	92	100	37	,,	49	49	65	24	,,
'05	98	98	107	40	,,	53	53	70	26	,,
'06	103	101	110	41	,,	57	56	74	27	,,
'07	103	103	112	42	,,	57	57	75	28	,,
'08	103	103	112	42	,,	57	57	75	28	,,
'09	103	103	112	42	,,	57	57	75	28	,,
1810	103	103	112	42	6	57	57	75	28	I
'11	103	103	112	42	,,	57	57	75	28	,,
'12	103	103	112	42	,,	57	56	74	27	,,
'13	102	102	111	41	,,	54	54	71	26	,,
'14	101	101	110	41	,,	52	52	69	26	,,
'15	100	100	109	40	,,	50	51	67	25	,,
'16	99	99	108	40	,,	50	50	66	24	,,
'17	98	98	107	40	,,	49	49	65	24	,,
'18	96	96	105	39	,,	48	48	63	24	,,
'19	95	95	104	39	,,	47	47	62	22	,,

Index Numbers for Agricultural Earnings Year by Year—Contd.

Years.	A. ENGLAND AND WALES.					B. SCOTLAND.				
	a. Index Numbers; Base 1892 = 100.	*b.* Index Numbers; Three-Yearly Averages.	*c.* Col. *b* with Base 1892 = 108.	*d.* Col. *b*, Reduced to £ sterling; Annual Earnings.	*e.* Weights Employed for General Average.	*a.* Index Numbers; Base 1892 = 100.	*b.* Index Numbers; Three-Yearly Averages.	*c.* Col. *b* with Base 1892 = 132.	*d.* Col. *b*, Reduced to £ sterling; Annual Earnings.	*e.* Weights Employed for General Average.
				£					£	
1820	93	91	99	37	6	46	45	59	22	1
'21	86	85	93	34	,,	42	42	55	21	,,
'22	75	79	86	32	,,	39	39	51	19	,,
'23	75	74	81	30	,,	37	38	50	19	,,
'24	71	74	81	30	,,	37	37	49	18	,,
'25	76	74	81	30	,,	37	37	49	18	,,
'26	76	76	83	31	,,	38	38	50	19	,,
'27	76	76	83	31	,,	38	38	50	19	,,
'28	76	76	83	31	,,	38	38	50	19	,,
'29	76	75	82	30	,,	38	38	50	19	,,
1830	74	75	82	30	6	38	38	50	19	1
'31	76	76	83	31	,,	38	38	50	19	,,
'32	78	78	85	32	,,	39	39	51	19	,,
'33	79	78	85	32	,,	39	39	51	19	,,
'34	77	77	84	31	,,	38	39	51	19	,,
'35	74	75	82	30	,,	41	41	54	20	,,
'36	75	75	82	30	,,	43	43	57	21	,,
'37	76	76	83	31	,,	46	46	61	23	,,
'38	78	78	85	32	,,	48	48	63	24	,,
'39	80	79	86	32	,,	51	51	67	25	,,
1840	80	80	87	32	6	53	53	70	26	1
'41	80	80	87	32	92	56	56	74	27	15
'42	80	80	87	32	94	58	58	77	28	15
'43	80	78	85	32	96	61	60	79	29	15
'44	75	75	82	30	98	61	61	81	30	15
'45	70	73	80	30	100	60	60	79	29	15
'46	75	73	80	30	101	60	60	79	29	15
'47	75	74	81	30	103	60	60	79	29	15
'48	71	72	79	29	105	60	60	79	29	15
'49	71	71	77	29	107	60	60	79	29	15
1850	71	71	77	29	109	60	60	79	29	15
'51	71	71	77	29	111	60	60	79	29	15
'52	71	74	81	30	111	60	63	83	31	15
'53	81	81	88	33	111	68	68	90	33	15
'54	91	89	97	36	111	76	74	98	36	15
'55	94	93	101	38	111	78	77	102	38	15
'56	94	92	100	37	110	78	77	102	38	14
'57	89	88	96	36	110	75	75	99	37	14
'58	82	85	93	34	110	71	72	95	35	14
'59	83	84	92	34	110	71	72	95	35	14

Index Numbers for Agricultural Earnings Year by Year—Contd.

	A.					B.				
	a.	b.	c.	d.	e.	a.	b.	c.	d.	e.
	ENGLAND AND WALES.					SCOTLAND.				
Years.	Index Numbers; Base 1892 = 100.	Index Numbers; Three-Yearly Averages.	Col. b with Base 1892 = 108.	Col. b, Reduced to £ sterling; Annual Earnings.	Weights Employed for General Average.	Index Numbers; Base 1892 = 100.	Index Numbers; Three-Yearly Averages.	Col. b with Base 1892 = 132.	Col. b, Reduced to £ sterling; Annual Earnings.	Weights Employed for General Average.
				£					£	
1860	87	86	94	35	110	74	73	96	36	14
'61	88	88	96	36	110	74	74	98	36	14
'62	88	88	96	36	109	74	74	98	36	14
'63	88	88	96	36	108	74	74	98	36	14
'64	88	88	96	36	106	74	74	98	36	13
'65	88	88	96	36	104	74	74	98	36	13
'66	88	89	97	36	102	74	74	98	36	13
'67	90	90	98	36	100	75	75	99	37	13
'68	92	92	100	37	98	76	77	102	38	12
'69	93	93	101	38	96	81	80	106	39	12
1870	94	96	105	39	94	84	84	111	41	12
'71	102	102	111	41	92	87	88	116	43	12
'72	111	109	119	44	91	93	93	123	46	12
'73	115	115	125	46	90	99	99	131	49	12
'74	120	117	128	47	89	105	105	139	51	11
'75	115	117	128	47	88	111	109	144	53	11
'76	115	115	125	46	87	111	111	147	54	11
'77	115	114	124	46	86	111	111	147	54	11
'78	112	111	121	45	85	111	108	143	53	10
'79	105	106	116	43	84	102	103	136	50	10
1880	101	101	110	41	83	97	97	128	48	10
'81	98	98	107	40	83	93	94	124	46	10
'82	95	96	105	39	82	93	93	123	46	10
'83	95	95	104	39	81	94	94	124	46	10
'84	94	94	103	38	80	95	95	125	47	10
'85	92	92	100	37	79	95	95	125	47	10
'86	90	91	99	36	78	96	96	127	47	10
'87	90	92	100	37	77	97	97	128	48	10
'88	95	94	103	38	76	97	97	128	48	9
'89	96	96	105	39	75	98	98	129	48	9
1890	97	97	106	39	74	99	99	131	49	9
'91	98	98	107	40	73	99	99	131	49	9
'92	100	99	108	40	73	100	100	132	49	9
'93	99	99	108	40	72	—	—	—	—	—
'94	99	99	108	40	72	—	—	—	—	—
'95	98	98	107	40	71	—	—	—	—	—
'96	96	97	106	39	71	—	—	—	—	—

Index Numbers for Agricultural Earnings Year by Year—Contd.

Years.	a. Index Numbers; Base 1892 = 100; Regular Earnings.	α. Index Numbers; Base 1892 = 100; allowing for Want of Work.	C. c. Col. a with Base 1892 = 67.	C. γ. IRELAND. Col. α with Base 1892 = 67.	d. Col. a, Reduced to £ sterling; Annual Earnings.	δ. Col. α, Reduced to £ sterling; Annual Earnings.	e. Weights Employed for General Average.
					£	£	
1770–90	35		23	23	9	9	8
1791........	36	35	24	23	9	9	,,
'92........	37	35	25	23	9	9	,,
'93........	38	36	25	24	9	9	,,
'94........	39	36	26	24	10	9	,,
'95.......	40	36	27	24	10	9	,,
'96.	41	37	27	25	10	9	,,
'97........	42	37	28	25	10	9	,,
'98........	43	37	29	25	11	9	,,
'99........	44	38	29	25	11	9	,,
1800........	45	38	30	25	11	9	8
'01........	46	38	31	25	12	10	,,
'02........	47	39	31	26	12	10	,,
'03........	48	39	32	26	12	10	,,
'04........	49	39	33	26	12	10	,,
'05........	50	40	33	27	12	10	,,
'06.......	50	40	33	27	12	10	,,
'07........	50	40	33	27	12	10	,,
'08........	50	40	33	27	12	10	,,
'09........	50	40	33	27	12	10	,,
1810........	50	40	33	27	12	10	8
'11........	50	40	33	27	12	10	,,
'12........	50	40	33	27	12	10	,,
'13........	49	40	33	27	12	10	,,
'14........	49	39	33	26	12	10	,,
'15........	49	39	33	26	12	10	,,
'16.......	48	38	32	25	12	10	,,
'17........	48	37	32	25	12	10	,,
'18........	47	36	31	24	12	9	,,
'19........	47	35	31	23	12	9	,,
1820........	46	34	31	23	12	9	8
'21........	46	33	31	22	12	8	,,
'22........	46	32	31	21	12	8	,,
'23........	46	32	31	21	12	8	,,
'24........	46	32	31	21	12	8	,,
'25........	47	32	31	21	12	8	,,
'26........	47	32	31	21	12	8	,,
'27........	48	32	32	21	12	8	,,
'28........	49	32	33	21	12	8	,,
'29........	50	32	33	21	12	8	,,

Index Numbers for Agricultural Earnings Year by Year—Contd.

Years.	a. Index Numbers; Base 1892 = 100; Regular Earnings.	α. Index Numbers; Base 1892 = 100; allowing for Want of Work.	c. Col. a with Base 1892 = 67.	C. γ. Col. α with Base 1892 = 67.	d. Col. a, Reduced to £ sterling; Annual Earnings.	δ. Col. α, Reduced to £ sterling; Annual Earnings.	e. Weights Employed for General Average.
				IRELAND.			
					£	£	
1830....... ..	49	31	33	21	12	8	8
'31........	49	30	33	20	12	7	,,
'32........	48	29	32	19	12	7	,,
'33........	47	28	31	19	12	7	,,
'34........	47	27	31	18	12	7	,,
'35........	46	26	31	17	12	6	,,
'36........	45	25	30	17	11	6	,,
'37........	44	24	29	16	11	6	,,
'38........	44	24	29	16	11	6	,,
'39........	44	24	29	16	11	6	,,
1840........	44	24	29	16	11	6	8
'41	45	24	30	16	11	6	120
'42........	45	24	30	16	11	6	117
'43........ ..	45	24	30	16	11	6	113
'44........	46	24	31	16	12	6	110
'45........	46	24	31	16	12	6	106
'46	46	24	31	16	12	6	103
'47........	46	24	31	16	12	6	99
'48........	46	24	31	16	12	6	96
'49	47	24	31	16	12	6	92
1850........	47	24	31	16	12	6	89
'51	47	25	31	17	12	6	85
'52	47	26	31	17	12	7	82
'53........	51	29	34	19	13	7	80
'54	55	34	37	23	14	8	77
'55........	59	40	40	27	15	10	75
'56........	62	43	42	29	15	11	72
'57........	65	45	44	30	16	11	70
'58	66	44	44	29	16	11	67
'59........	67	43	45	29	16	11	65
1860........	68	42	46	28	17	10	62
'61........	69	41	46	28	17	10	60
'62........	70	42	47	28	17	10	59
'63........	70	43	47	29	17	11	58
'64	71	44	48	29	18	11	57
'65........	72	45	48	30	18	11	56
'66........	73	46	49	31	18	12	55
'67........	74	47	50	31	18	12	54
'68........	75	48	50	32	19	12	53
'69........	76	50	51	33	19	12	52

Index Numbers for Agricultural Earnings Year by Year—Contd.

Years.	a. Index Numbers; Base 1892 = 100; Regular Earnings.	α. Index Numbers; Base 1892 = 100; allowing for Want of Work.	c. * Col. a with Base 1892 = 67.	C. γ. IRELAND. * Col. α with Base 1892 = 67.	d. * Col. a, Reduced to £ sterling; Annual Earnings.	δ. * Col. α, Reduced to £ sterling; Annual Earnings.	e. Weights Employed for General Average.
					£	£	
1870........	77	52	52	35	19	13	51
'71........	80	56	54	38	20	14	51
'72........	84	60	56	40	21	15	49
'73........	89	65	59	44	22	16	47
'74........	90	72	61	48	23	18	44
'75........	96	78	64	52	24	19	42
'76........	102	82	67	54	25	20	40
'77........	104	82	69	54	26	20	38
'78........	103	80	69	54	26	20	36
'79........	100	78	67	51	25	19	34
1880........	97	72	65	50	24	18	32
'81........	95	72	64	48	24	18	30
'82........	95	73	64	49	24	18	29
'83........	95	74	64	50	24	19	29
'84........	94	76	63	51	24	19	28
'85........	93	78	62	53	23	20	28
'86........	92	82	62	55	23	20	28
'87........	93	85	63	57	23	21	27
'88........	95	88	64	59	24	22	27
'89........	96	91	64	61	24	23	27
1890........	97	94	65	63	24	24	26
'91........	98	97	66	65	25	24	26
'92........	100	100	67	67	25	25	26
'93........	101	101	68	68	25	25	25
'94........	104	104	68	68	25	25	25
'95........	100	100	67	68	25	25	25

* From 1873 onwards three-yearly averages are used.

Index Numbers for Agricultural Earnings Year by Year—Contd.

Years.	D.		
	c.	γ.	δ.
		UNITED KINGDOM.	
	Weighted Average of A c, B c, C c; General Index Number for United Kingdom; Base 1892 = 100.	Weighted Average of A c, B c, C γ; General Index Number for United Kingdom; Base 1892 = 100.	D γ Reduced to £ sterling; Annual Earnings.
			£
1770–88	36		13
'89.........	37		14
1790........	38		14
'91........	39	39	14
'92........	41	40	15
'93........	41	41	15
'94........	44	43	16
'95........	46	45	17
'96........	49	47	17
'97..... ...	51	49	18
'98........	52	50	18
'99........	53	51	19
1800........	55	52	19
'01........	57	53	20
'02........	57	54	20
'03........	59	56	21
'04........	62	59	22
'05........	65	62	23
'06........	66	63	23
'07........	67	64	24
'08........	67	64	24
'09........	67	64	24
1810........	67	64	24
'11........	67	64	24
'12........	67	64	24
'13........	67	64	24
'14........	67	63	23
'15........	66	62	23
'16........	65	61	23
'17........	64	60	22
'18........	63	58	21
'19........	62	58	21
1820........	60	56	21
'21........	57	53	20
'22........	54	49	18
'23........	52	47	17
'24........	52	47	17
'25........	52	47	17

Index Numbers for Agricultural Earnings Year by Year—Contd.

Years.	c. Weighted Average of A c, B c, C c; General Index Number for United Kingdom; Base 1892 = 100.	D. γ, UNITED KINGDOM. Weighted Average of A c, B c, C γ; General Index Number for United Kingdom; Base 1892 = 100.	δ. D γ Reduced to £ sterling; Annual Earnings.
			£
1826........	53	48	18
'27........	54	48	18
'28........	54	48	18
'29........	54	47	17
1830........	54	47	17
'31........	54	47	17
'32........	54	48	18
'33........	54	48	18
'34........	54	47	17
'35........	53	45	17
'36........	53	46	17
'37........	53	46	17
'38........	54	47	17
'39........	54	47	17
1840........	55	48	18 .
'41........	56	49	18
'42........	57	50	18
'43........	57	50	18
'44........	57	49	18
'45........	56	49	18
'46........	57	50	18
'47........	58	51	19
'48........	58	51	19
'49........	57	51	19
1850........	58	52	19
'51........	59	53	20
'52........	61	56	21
'53........	67	61	23
'54........	74	69	26
'55........	78	73	27
'56........	80	74	27
'57........	77	72	27
'58........	77	71	26
'59........	76	71	26
1860........	78	72	27
'61........	80	74	27
'62........	80	74	27
'63........	80	74	27

Index Numbers for Agricultural Earnings Year by Year—Contd.

Years.	c. Weighted Average of A c, B c, C c; General Index Number for United Kingdom; Base 1892 = 100.	D. γ. UNITED KINGDOM. Weighted Average of A c, B c, C γ; General Index Number for United Kingdom; Base 1892 = 100.	δ. D γ Reduced to £ sterling; Annual Earnings.
			£
1864........	81	74	27
'65........	81	75	28
'66........	82	76	28
'67........	83	77	28
'68........	84	78	29
'69........	85	79	29
1870........	88	83	31
'71........	93	87	32
'72........	99	94	35
'73........	105	100	37
'74........	108	104	38
'75........	110	106	39
'76........	110	106	39
'77........	110	106	89
'78........	108	104	38
'79........	105	100	37
1880........	100	96	36
'81........	98	93	34
'82........	97	93	34
'83........	96	93	34
'84........	95	93	34
'85........	93	91	34
'86........	92	91	34
'87........	94	92	34
'88........	96	94	35
'89........	97	96	36
1890........	99	98	36
'91........	99	99	37
'92........	**100**	**100**	37
'93........	100	100	37
'94........	100	101	37
'95........	100	100	37

III.—*Agricultural Returns of Great Britain*, 1899.

THE following preliminary statement of the extent of the various crops and the number of live stock in Great Britain for the current year has been issued by the Board of Agriculture. The tables are compiled from the returns collected on the 5th June, and comparisons with previous years are also included :—

Crops and Live Stock.	1899.	1898.	1897.
	Acres.	Acres.	Acres.
Wheat	2,000,981	2,102,206	1,889,161
Barley	1,982,108	1,903,666	2,035,790
Oats	2,959,755	2,917,760	3,036,056
Potatoes	547,682	524,591	504,914
Clover and rotation grasses — For hay	2,214,883	2,381,551	2,285,965
Not for hay	2,593,068	2,529,799	2,567,843
TOTAL	4,807,951	4,911,350	4,853,808
Permanent pasture — For hay	4,339,025	4,536,315	4,510,333
Not for hay	12,291,662	12,023,077	12,002,535
TOTAL	16,630,687	16,559,392	16,512,868
Hops	51,843	49,735	50,863
	No.	No.	No.
Cows and heifers in milk or in calf	2,671,260	2,587,190	2,532,379
Other cattle—2 years and above	1,341,310	1,381,595	1,323,230
„ 1 year and under 2	1,388,511	1,345,844	1,360,741
„ Under 1 year	1,394,639	1,307,735	1,284,147
TOTAL OF CATTLE	6,795,720	6,622,364	6,500,497
Ewes kept for breeding	10,460,837	10,137,932	10,006,697
Other sheep—1 year and above	6,040,600	6,203,858	6,219,001
„ Under 1 year	10,736,227	10,401,404	10,114,742
TOTAL OF SHEEP	27,237,664	26,743,194	26,340,440
Sows kept for breeding	375,911	362,200	334,244
Other pigs	2,247,902	2,089,395	2,008,058
TOTAL OF PIGS	2,623,813	2,451,595	2,342,302

1899 *Compared with* 1898.

Crops and Live Stock.	Increase.		Decrease.	
	Acres.	Per Cent.	Acres.	Per Cent.
Wheat	—	—	101,225	4·8
Barley	78,442	4·1	—	—
Oats	41,995	1·4	—	—
Potatoes	23,091	4·4	—	—
Clover and rotation grasses { For hay	—	—	166,668	7·0
Not for hay	63,269	2·5	—	
TOTAL	—	—	103,399	2·1
Permanent pasture { For hay	—	—	197,290	4·3
Not for hay	268,585	2·2	—	—
TOTAL	71,295	0·4	—	—
Hops	2,108	4·2	—	—
	No.	Per cent.	No.	Per cent.
Cows and heifers in milk or in calf	84,070	3·2	—	—
Other cattle—2 years and above	—	—	40,285	2·9
,,　　　　1 year and under 2	42,667	3·2	—	—
,,　　　　Under 1 year	86,904	6·6	—	—
TOTAL OF CATTLE	173,356	2·6	—	—
Ewes kept for breeding	322,905	3·2	—	—
Other sheep—1 year and above	—	—	163,258	2·6
,,　　　　Under 1 year	334,823	3·2	—	—
TOTAL OF SHEEP	494,470	1·8	—	—
Sows kept for breeding	13,711	3·8	—	—
Other pigs	158,507	7·6	—	—
TOTAL OF PIGS	172,218	7·0	—	—

IV.—*Notes on the Proceedings of the International Statistical Congress at Christiania.*

THE seventh Congress of the International Statistical Institute was inaugurated at Christiania on the 2nd September, by the reception of the members and visitors by H.M. the King at a *levée* held for the purpose during His Majesty's short visit to his Norwegian capital. On the following Monday the business of the Congress was formally opened by M. Qvam, Minister of the Interior, in a speech of welcome, supplemented by others to the same effect by Dr. Schœnberg, Dean of the University, in whose building the meetings took place, and by M. Kiær, President of the Reception Committee. An expression of general regret at the absence of Sir Rawson W. Rawson, the President, was unanimously carried, and communicated by telegram in the graceful wording of

M. Levasseur, the senior Vice-President, who, as on the preceding occasion, was called upon to fill the place so long occupied by our distinguished countryman.

Thirty-three members of the Institute and ninety-six visitors attended. Of the latter about forty were from Norway itself, and in all fifteen countries out of the twenty-one contributing members were represented. France provided eleven, Russia nine, Great Britain and Sweden six respectively. Four attended from each of the three countries Austria, Germany, and Denmark. The British members were Sir R. Giffen and Mr. A. Bateman, ex-Presidents of this Society, the latter representing the Board of Trade; Major Craigie and Mr. Baines, Honorary Secretaries of the Society, representing respectively the Board of Agriculture and the Secretary of State for India. Dr. Edmund Gosse and Mr. N. Cohen, the latter a member of the Society's Council, were invited as visitors.

In the course of the proceedings four new members were elected by vote of those present, the three Vice-Presidents, Messrs. Levasseur, Tröinitsky, and Lexis, together with the Secretary, M. Bodio, and the Treasurer, Mr. Bateman, were re-elected, and, after unanimously passing a request to Sir Rawson Rawson that, though not able to preside in person, he should continue to honour the Institute by accepting the post of Honorary President, the Congress elected as its President for the next two years, Dr. von Inama-Sternegg, President of the Central Statistical Office of Austria-Hungary, and Member of the Upper Chamber of Austria, whose work in statistics and economy is of European renown. The invitation on the part of the Austro-Hungarian Government to hold the next Congress at Budapesth, it may be here mentioned, was formally communicated by Dr. Jekel-Falussy, Director of the Hungarian Central Statistical Bureau, and accepted.

The session lasted five days, meetings in Congress or Committee being held morning and afternoon daily. There was a divergence from former practice in the distribution of the work, in that two sections only, one for demographic, the other for economic subjects, were appointed. It was left open to the former to subdivide further, so as to separate the judicial statistics from the rest, if found necessary, but, owing to the absence of several members who had been expected to contribute papers, one morning's sitting sufficed for the discussion of the special branch in question.

The subjects brought before the Congress will be treated of, as on the last occasion, in a special Note, later in the year. For the present, therefore, it will be enough to mention, for the information of readers of the *Journal*, some of the principal communications presented. In the economic section, papers in continuation of the proceedings at the preceding Congress were read by Mr. Bateman, upon the comparability of commercial statistics, with special reference to goods in transit; by M. Neymarck, upon uniformity in estimates of the value of personal securities; by M. de Foville, on international statistics of currency and the precious metals; by Dr. Stieda, upon the sources of information regarding prices in past centuries, and by M. Levasseur, supplemented by Major

Craigie, upon the collection of agricultural statistics. The last was advanced a stage by the nomination of Major Craigie to collate all the information obtained, and to report upon the whole question in anticipation of the next Congress. Interesting papers were also read by Dr. Blau, on prices in Russia; by M. Faure, upon the taxation of personal property in different countries ; by Major Craigie, on statistics of cattle, and by General Borkowski, upon the registration of inland water traffic in Russia. Herr Krag, head of the road department of the Norwegian Government, contributed an extensive and valuable collection of diagrams relating to various branches of the statistics of his country.

In the demographic section, M. Bertillon's system of nomenclature of the causes of death, together with the suggestion that it should be subject to decennial revision in accordance with the progress of medical science, was referred to the Statistical Societies and Institutes of the different countries. Dr. Körösy related the progress of adhesion to the scheme adopted for the international comparison of census results. Dr. von Inama-Sternegg continued the detailed examination he reported in 1892 into Vienna pauperism, and by the help of the Hollerith machine, he was able to present very detailed and well-combined tables on the subject. His proposal to recommend a register of individual cases in such detail as would serve as evidence of what he called the " morphology of pauperism," was adopted. Dr. Rauchberg read a paper recommending some far-reaching methods of exhibiting statistics of the population by occupation, which was in part adopted. Dr. Tröinitsky gave an interesting description of his great work in connection with the tabulation of the results of the Russian census, and distributed copies of the first fruits of his labours. Herr Sundbärg, of the Swedish Statistical Bureau, produced and explained his tables upon the distribution of the population by age and the rate of mortality, and Dr. Fahlbeck, of Lund University, read his review of the life-values of the nobility of Sweden. Direktor Kiær brought up his report upon the best means of ascertaining the population and its composition in uncivilised countries, discussed in part at the preceding Congress, and a sub-committee was nominated to collect information and advice on the matter before the next Congress. Papers on Judicial Statistics were read by Dr. Bodio, in favour of a detailed registration of the individual accused, by Dr. Bosco, who gave a sketch of the movement of criminality of late in the various countries of Europe, and by M. Tarde, whose comprehensive series of diagrams on the judicial statistics of France was accompanied by terse and lucid explanations, which it is to be hoped will ultimately find their way on to the record.

This sketch of the proceedings would be incomplete without a reference to the acknowledgment, endorsed by acclamation, with which M. Levasseur closed the session, of the great consideration shown by Direktor Kiær and his colleagues on the organising committee to the wants and comforts of a gathering like that of the Congress, and of the unbroken success with which all their arrangements had been carried out.—J. A. B.

V.—*Notes on Economical and Statistical Works.*

The Science of Finance. By Henry Carter Adams, Ph.D., LL.D. 573 pp., 8vo. New York: Henry Holt and Co., 1898.

Professor Adams's treatise is an additional evidence to the increasing interest in financial science in America which has been otherwise manifested in recent years.   In bulk and in arrangement it is in some ways more convenient for the use of students than the other works on this subject in the English language which we have recently had occasion to notice.   A departure from the mode of treatment adopted by many other writers deserves mention.   The author opens his analysis of public expenditures by setting forth the outlines of a theory of social evolution, which rests but little on direct statistical analysis in the determination of the tendencies towards increase or reduction, relative or absolute, of different lines of expenditure.   Apart from the difficulties attending the proper interpretation of the statistics of expenditures, the other mode of approaching the problem possesses an attractiveness of its own.   One of the conclusions reached is that " governments must continually increase the amount of money placed at the disposal of their statistical service."

We cannot follow the author in any detail through this valuable volume, but it may be observed that in discussing the appropriate rule of division of the burden of taxation, he dismisses the " equality of sacrifice " concept as inferior to, and not, as some think, the equivalent of, "ability to pay."   His conclusion is in favour of the principle of progression in taxation.

While there cannot be said to be, at the present time, as great a need for such a text-book as this as was the case a few years back, it is probable that a considerable field of usefulness, not occupied by any existing treatise, remains for this work.   It is, at any rate, welcome as a sign of activity in a study which has been neglected in an almost dangerous degree.

The Elements of Vital Statistics. By Arthur Newsholme, M.D., F.R.C.P.   Third edition.   353 pp., 8vo.   London: Swan, Sonnenschein, and Co., 1899.

We direct attention to the new edition of Dr. Newsholme's well-known work with great pleasure.   It is, as its title page declares, almost entirely re-written.   A reduction in bulk is one result, as the reader is expected to have available certain standard collections of English vital statistics, and hence not to need extensive extracts from them in the text of the book.   The tables from foreign sources have been enlarged,—a set-off to the reduction of the English tables.   The work being intended specially for the use of medical men,—including medical officers of health,—they will find here an account of the way in which life tables are prepared, and in chapter xxiii Dr. Hayward, (whose paper on this subject will be found elsewhere in the present number of the *Journal,*) supplies a description of the construction of a life table by the analytical method.

The usefulness of the volume has been in these and other ways increased not a little, and we are not aware of any ways in which this increase is counterbalanced by changes for the worse. We could wish that some of the suggestions it contains of the need for fuller or more accurate statistical material might bear rich fruit.

Die Landbauzonen der aussertropischen Länder. Von Th. H. Engelbrecht. 3 vols. Berlin, 1899.

Of the three volumes of this laborious study of the distribution of the different modes of culture of land, the first is devoted to a description of the methods followed, and to a general account and discussion of the results set forth in the tables of the second volume and the cartograms of the third. These latter are the means of conveying most directly and effectively to the eye the complex results of the collection of statistical tables which, as stated, occupy the second and most bulky section of the work.

The cartograms show the distribution of the chief crops and farm animals according to a method of comparison selected by the author himself. He urges the inappropriateness of representing the proportions to the total area or total population of the countries entering into the comparison, simply. For crops, the proportion which the area devoted to each single crop bears to that devoted to cereals proper is depicted. Rice, maize and millet are classed as "unechten Getreiden," with Körnicke, and hence the distribution for a country like the United States of America is shown very differently from what it would appear if, with the cereals proper, were included "corn" in order to form a basis of comparison to show the importance of each individual crop.

For farm animals, similarly, the cartograms which depict the distribution of the various animals show the proportions of their numbers to those of horned cattle, herein including calves. It may be a matter of question whether, in selecting the particular basis of comparison, the best has been chosen, but there can hardly be a question that such relative distributions show the real facts more effectively than any tables or maps which should refer simply to the area or population of each unit of area. Great care too has been shown in the selection, and the choice made is defended with ability by the author.

The tabular statements give not merely the latest available results, but also comparisons with earlier dates, in some cases with several earlier dates, and some maps reproduce these records of historical development. We do not quite know why 1892 is the latest year selected for British agricultural statistics, unless, perhaps, one may suppose it the latest for which figures were available when this section of the work was prepared. The same date is the latest for French figures. For the German Empire the latest figures are those for 1893, while for New Zealand they come down to 1896. The figures appear to be derived in every case direct from the official records of the countries concerned, and the blank spaces on some of the maps show only too clearly some obvious gaps in the records. When we state that the atlas con-

tains seventy-nine coloured maps, we shall indicate but slightly the wealth of information which the work comprises.

Local Variations in Wages. By F. W. Lawrence, M.A. 83 pp., 4to., with four maps. London : Longmans, Green, and Co., 1899.

This essay in a difficult field of investigation is very welcome. The problem is, to determine the distribution of high- and low-wage areas. The variations from trade to trade confuse the investigation, but Mr. Lawrence has endeavoured to avoid this confusion by confining his inquiries to the building, printing, and iron working industries, thus securing a wide area of comparison. The first of the three sets of trades was that used for the more extensive part of the work, the intensive investigation touching fewer localities but more trades. It will be observed that town industries alone are laid under contribution.

In exhibiting the results graphically, the difficulty of being unable to use three-dimensional representations is avoided by placing the towns in an order arrived at by drawing a line zigzag to-and-fro across the country, beginning at the south, and taking towns in the order of juxtaposition thus determined. For some purposes another order, that of the height of the mean wage, is observed. The conclusions reached are not very definite for the most part, but a beginning has here been made in a very difficult inquiry, and succeeding investigators will reach more definite results with less labour.

A remark may be made on certain comparisons between the size of towns and their wage-level. We notice that in treating of Liverpool and Manchester the figures of population used are those, not of the populations aggregated together in a mass in these places, but of a section only of that population. In the case of Manchester the matter is clearest. The figure taken for population there omits the couple of hundred thousand inhabitants of Salford, and this in spite of the fact that one of the later tables heads a column in which this error of population occurs, " Manchester and Salford." There are also two opinions as to the adequacy of the open spaces of Manchester.

A great mass of information has been carefully collected and laboriously tabulated by the author, and in examining differences between neighbouring places, abundant evidence of the operation of well-known influences may be found. So far as relates to the classes covered by the inquiry, there stands out one general result which is expressed thus by one of the author's authorities : " It will generally be found that the larger the town, the higher the wage, because the greater are the demands for social life." And yet, in some of the districts where wages are highest, we find that that very important demand of social life, abundance of house room, is allowed to be sacrificed to recreation, not necessarily of the most wholesome kind. Taken altogether, the conceptions of artisans in the matter of house room are not the least instructive of the facts gathered in this valuable investigation.

On Centenarians. By T. E. Young, B.A., F.R.A.S. 147 pp., 4to. London : Charles and Edwin Layton, 1899.

Of new material contributed to the discussion of the duration of human life, the first chapter contains all that this volume offers, and one might even say that a couple of pages of that chapter suffice. A table of eighteen annuitants and four assured persons, whom recent authentic investigations record as attaining 100 years or more, is supplied. Besides comments on this table and on previous writings on the subject of centenarians, the volume contains a number of speculations on the duration of the solar system and the stage of evolution at which it has arrived. We do not think it worth while to discuss in detail this portion of the book. Both in the fashioning of his phrases and in the statements he makes, the author proves himself an amateur in physical science, and his struggles in waters too deep for him possess no special interest. When discussing the nature of the evidence required to establish the fact of a certain person having attained a great age, his remarks are to the point, as might be expected from a former president of the Institute of Actuaries, but excursions into biblical criticism and physical speculations are matters of quite another order.

A Russian Province of the North. By Alexander Platonovich Engelhardt. 356 pp., 8vo., with three maps. 18*s.* Westminster : Archibald Constable and Co., 1899.

We have received, under the above title, the translation of an account by the governor of the province of Archangel of his travels in that province, and of the condition of the country and of its people. This account enables its reader to realise the economic condition and possibilities of the distant northern district of Russia, to which attention has recently been directed by the works undertaken at Ekaterina Harbour in establishing there a naval station. In an appendix are given tables showing the agricultural and other produce of the province in recent years. The growth of foreign trade between 1893 and 1897 is recorded at about 55 per cent. in value, and its total in the latter year was about 1,200,000*l.*, imports of fish and exports of wood in various forms constituting the chief items on the two sides of the account. With the improvement of the means of communication, there is no doubt that the resources of the province could be enlarged, and the new port, said to be open at all seasons of the year, may bring it into closer contact with the world at large.

The Growth of Cities in the Nineteenth Century. By Adna Ferrin Weber, Ph.D. 488 pp. $3·50. New York : The Macmillan Company, 1899.

This monograph on the modern problem of city growth, by the Deputy Commissioner of Labor Statistics of New York State, forms the eleventh volume of the Studies in History, Economics, and Public Law prepared for Columbia University. It contains a careful and exhaustive study of the statistics of cities all over the world, and a thorough discussion of the results of the comparisons

thus made. The first portion of the volume, the purely statistical material, will be found a mine of information. It is true that an occasional failure to completely grasp the geographical aspect of the problems discussed, in the case of cities less universally familiar than the gigantic metropolitan cities of the leading countries, may be traced by a close observer, but the instances do not seem to be many or the consequent errors serious. Very great care is taken to avoid making comparisons between things which are not comparable.

In the discussion of the causes of the increasing concentration of population, Dr. Weber traverses much familiar ground, and the result of his study of the situation as elucidated by the statistical material already mentioned, is the anticipation that we are not yet at the end of the movement towards concentration. He rejects pessimistic views as to a near scarcity and dearness of the food supply for growing city populations, and also as to some of the demoralising influences of city life. The nature of city populations, their age and sex distribution, migration to and from crowded centres, and differences of migration as between the sexes, are some of the branches of the subject to which the author devotes careful and welcome attention, while he does not, of course, omit a considerably detailed study of vital statistics of cities.

We have noticed that Dr. Weber believes that the concentration of population which has been already long notable, will continue for a considerable time to come, but if it do, "it will be a modified concentration, which offers the advantages of both city and country life." This he holds in spite of the view that "the large cities are growing more rapidly than the small cities, and absorbing the great bulk of the urban increase." The reconciliation between these views is seen in the consideration of "the rise of the suburbs."

The references to authorities, and bibliographical information included in the volume, add to its value to the student of any of the many problems which are treated in its pages.

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        May—L'origine del baratto : a proposito di un nuovo studio del cognetti : *M. Pantaleoni* (*continued in July*). La partecipazione dello stato ai profitti delle banche di emissione : *P. Des Essars.* Margarina economica : *V. Pareto.*

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VI.—*Quarterly List of Additions to the Library.*

Additions to the Library during the Quarter ended 15th September, 1899, arranged alphabetically under the following heads:—(a) *Foreign Countries;* (b) *India and Colonial Possessions;* (c) *United Kingdom and its Divisions;* (d) *Authors, &c.;* (e) *Societies, &c. (British);* (f) *Periodicals, &c. (British).*

The Society has received, during the past quarter, the current numbers—either quarterly, monthly, or weekly—of the periodical official publications dealing with the following subjects :—

Consular Reports—From Austria-Hungary, United States, and United Kingdom.

Labour Reports, &c.—From Belgium, France, United States, New York State, New Zealand, and United Kingdom.

Trade Returns—From Argentina, Austria-Hungary, Belgium, Bulgaria, China, Egypt, France, Germany, Greece, Italy, Mexico, Netherlands, Russia, Spain, Sweden, United States, India, Canada, and United Kingdom.

Vital Statistics—From Argentina, Egypt, Germany, Italy, Netherlands, Roumania, Switzerland, United States (Connecticut and Michigan), Queensland, South Australia, and United Kingdom.

Vital Statistics of following Towns—Buenos Ayres, Brünn, Prague, Brussels, Copenhagen, Berlin, Dresden, Hanover, Bucharest, Madrid, Montevideo, London, Manchester, Dublin, Edinburgh, and Aberdeen.

The Society has received during the past quarter the current numbers of the following unofficial Periodicals and Publications of Societies, &c., arranged under the Countries in which they are issued :—

Denmark—Nationalökonomisk Tidsskrift.

Egypt—Bulletins et Mémoires de l'Institut Égyptien.

France—Annales des Sciences Politiques. Économiste Français. Journal des Économistes. Monde Économique. Polybiblion, Parties Littéraire et Technique. Réforme Sociale. Le Rentier. Revue d'Économie Politique. Revue Géographique internationale. Revue de Statistique. Musée Social, Circulaires, &c. Société de Statistique de Paris, Journal.

Germany—Archiv für Soziale Gesetzgebung und Statistik. Jahrbuch für Gesetzgebung, Verwaltung, und Volkswirtschaft. Jahrbücher für National-ökonomie und Statistik. Zeitschrift für die gesamte Staatswissenschaft. Zeitschrift für Socialwissenschaft.

Italy—L'Economista. Giornale degli Economisti. Rivista Italiana di Sociologia.

Unofficial Periodicals and Publications of Societies, &c.—*Contd.*

Spain—Sociedad Geografica de Madrid, Boletin y Revista.

Sweden—Eknonmisk Tidskrift.

Switzerland—Journal de Statistique suisse.

United States—Banker's Magazine. Bradstreet's. Commercial and Financial Chronicle, with supplements. Engineering and Mining Journal. Journal of Political Economy. Political Science Quarterly. Quarterly Journal of Economics. Yale Review. American Academy of Political and Social Science, Annals and Bulletin. American Economic Association, Economic Studies and Publications. American Geographical Society, Bulletin. American Statistical Association, Quarterly Publications. American Philosophical Society, Proceedings. Columbia University, Studies in History, &c. Sound Currency Committee, Leaflets.

India—Indian Engineering. Asiatic Society of Bengal, Journal and Proceedings.

Canada—The Chronicle: Insurance and Finance.

New Zealand—Government Insurance Recorder. Trade Review and Price Current.

United Kingdom—The Accountant. Accountants' Magazine. Athenæum. Australian Trading World. Bankers' Magazine. Bimetallist. British Trade Journal. Building Societies and Land Companies Gazette. Citizen. Colliery Guardian. Commercial World. Cotton. Economic Journal. Economic Review. Economist. Fireman. Incorporated Accountants' Journal. Insurance Post. Insurance Record. Insurance Spectator of London. Investors' Monthly Manual. Investors' Review. Iron and Coal Trades' Review. Johannesburg Standard and Diggers' News, London edition. Labour Co-partnership. Licensing World. Machinery Market. Nature. Policy-Holder. Post Magazine. Public Health. Sanitary Record. Shipping World. Statist. Anthropological Institute, Journal. Cobden Club, Leaflets. East India Association, Journal. Imperial Institute, Journal. Institute of Actuaries, Journal. Institute of Bankers, Journal. Institution of Civil Engineers, Minutes of Proceedings. Iron and Steel Institute, Journal. Lloyd's Register of British and Foreign Shipping, Statistical Tables. London Chamber of Commerce, Journal. Manchester Literary and Philosophical Society, Memoirs and Proceedings. Royal Agricultural Society, Journal. Royal Asiatic Society, Journal. Royal Colonial Institute, Proceedings. Royal Geographical Society, Geographical Journal. Royal Irish Academy, Proceedings and Transactions. Royal Meteorological Society, Meteorological Record and Quarterly Journal. Royal Society, Proceedings. Royal United Service Institution, Journal. Sanitary Institute, Journal. Society of Arts, Journal. Surveyors' Institution, Professional Notes and Transactions.

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Durchschnittspreise von Weizen, Korn, Gerste, Hafer, und Mais in Marktorten. (Current monthly numbers.) Sheets	The Central Statistical Commission

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NOTES *on the* FOOD SUPPLY *of the* UNITED KINGDOM, BELGIUM,
FRANCE, *and* GERMANY. *By* R. F. CRAWFORD.

[Read before the Royal Statistical Society, 21st November, 1899.
Major P. G. CRAIGIE, Vice-President, in the Chair.]

HITHERTO the question of food supply has been considered mainly
in relation to the nation's provision of bread. I propose, however,
to take a wider view of the subject, and to embrace in my inquiry
other fundamental articles of diet consumed in the United
Kingdom and in the other countries mentioned in these notes.
As regards my reasons for the inclusion of the countries named
above, I may say that I have selected Belgium because she has a
density of population exceeding our own, and her ports are
free to most food-stuffs; Germany, as furnishing an interesting
illustration of a country with a rapidly growing population,
whose energies are beginning to be diverted from agriculture
to other industrial channels; and France, as an instance of a
nation whose population and industrial activities are comparatively
immobile.

For the purposes of this paper the expression "food" will
embrace bread-stuffs, meat, potatoes, milk and milk products. Beer,
tea, rabbits, fish, jams, and many other popular beverages and
edibles, which are assimilated with much enterprise and more or
less success by the human digestion, must, so far as concerns our
inquiry to-night, be regarded as luxuries. The importance of sugar
in the dietary of the population cannot, however, be overlooked,
and this article will have to be taken into consideration when we
come to compare later the position of our own and some other
countries in respect of this question of food supply.

The staple bread-stuff of the United Kingdom is wheat, and
the relative proportions of the home production and imports of
this cereal are set forth in Table I. To save frequent reference to
the Appendix, the figures relating to the past few years for
this and other articles are reproduced in the text.

Wheat.

Period.	Average Annual Supply from Home Production, less Seed, 2 Bushels per Acre.	Average Annual Imports, less Exports of Wheat and Wheat Flour as Grain.	Average Annual Total Supply.	Average Annual Supply per Head of the Population.		
				From Home Production.	From Imports.	Total.
	Qrs.	Qrs.	Qrs.	lbs.	lbs.	lbs.
1892–94	7,054,000	21,955,000	29,009,000	88	274	362
'93–95	6,420,000	22,896,000	29,316,000	79	283	362
'94–96	5,918,000	23,355,000	29,273,000	73	286	359
'95–97	6,063,000	22,721,000	28,784,000	74	276	350
'96–98	6,391,000	21,664,000	28,055,000	77	261	338

It is not necessary for me to dwell upon the features presented by this table. The publicity given in 1898 to the report of the National Committee on Wheat Stores, and more recently to the speculations of an eminent scientific authority on what is sometimes called " the wheat problem," have induced most of us to take more than a passing interest in the contents of the national bread cupboard, if they have not caused us some apprehension lest we should one day experience the disappointment of Old Mother Hubbard. Consequently, the figures given above relating to the provision of our daily bread will not provide sensational copy for the *Journal of the Royal Statistical Society.* It is now common knowledge that we obtain from transmarine sources over three-fourths of the wheat consumed in this country, or, in other words, our own production of the so-called Staff of Life represents less than one quarter of every loaf of bread consumed by the inhabitants of this country. It will be seen that the total annual supply of wheat has amounted, on the averages of recent years, to 354 lbs. (or 5·9 bushels), of which 78 lbs. is home grown and 276 lbs. imported.

But the Staff of Life is not now our sole support. In these days of polyglot *menus* and acquired tastes, even the poor man's " ordinary " has its *pièces de résistance.* Let us therefore examine our position with respect to meat. Table II of the Appendix shows the estimated home production and imports of meat of all kinds in each of the past ten years; in the analytical tables following it the details for beef, mutton, and pigmeat are separately distinguished. The totals for recent years are given below.

Meat.

Period.	Average Annual Home Production.	Average Annual Imports, Live and Dead.	Average Annual Total Supply.	Supply per Head of the Population.		
				Home Production.	Imports.	Total.
	Tons.	Tons.	Tons.	lbs.	lbs.	lbs.
1892–94	1,385,000	667,000	2,052,000	81	39	120
'93–95	1,374,000	689,000	2,063,000	79	40	119
'94–96	1,388,000	787,000	2,175,000	79	45	124
'95–97	1,393,000	871,000	2,264,000	79	49	128
'96–98	1,397,000	953,000	2,350,000	78	54	132

An explanation of the methods of calculation by which these figures are obtained is given in the notes under the tables. Briefly stated, the process consists in converting into meat, upon the basis of the estimated dressed carcase weight of each class of stock, the home-bred animals slaughtered annually for food, as well as the live animals imported, and adding thereto the imports of dead meat. It will be noticed that the supply of meat of all kinds now represents an annual consumption approaching 130 lbs. per head of the population, of which nearly 80 lbs. is the produce of this country. The ration of 130 lbs. consists roughly of 63 lbs. of beef, 32 lbs. of mutton, and 35 lbs. of pork. A noteworthy and satisfactory feature, at any rate to those of us who do not pursue the cult of vegetarianism, is that there has been practically no diminution in the quantity of home-grown meat contributed to the total supply. It is true that our own production has not kept pace with the growth of the population, still, on the other hand, it does not, as in the case of wheat, exhibit an absolute decline. This statement of our apparent capabilities as producers of food may afford some comfort to carnivorous members of the community; but their satisfaction will be modified to some extent when we proceed to inquire, as we shall do presently, how far the meat usually regarded as home-grown can be said to be the produce of the soil of the United Kingdom.

Meanwhile potatoes present themselves next for consideration as the natural concomitants of meat and bread. The facts relating to our supply of these nourishing esculents are distinctly encouraging. Here is one important article of diet which we produce in quantities almost sufficient to meet our own wants. The following table shows the estimated production and net imports since 1892 :—

Period.	Average Annual Home Production, Deducting Seed.	Average Annual Net Imports.	Average Annual Available Supply.	Supply per Head of the Population.
	Tons.	Tons.	Tons.	lbs.
1892–94	4,833,000	83,000	4,916,000	286
'93–95	5,313,000	102,000	5,415,000	313
'94–96	5,217,000	116,000	5,333,000	305
'95–97	5,040,000	146,000	5,186,000	294
'96–98	4,773,000	197,000	4,970,000	280

At this point it may be of interest to note that an examination of the records of the production and imports since 1884 would appear to indicate that the potato is losing some of its popularity as an article of diet in this country. The supplies per head have fallen by about 12 per cent., and although this drop may be due largely to the decrease of the poorer population of Ireland, the diminution in consumption is greater than could be explained by the loss of consuming power consequent upon Irish emigration.

Bread, meat, and potatoes can scarcely be considered, either statistically or otherwise, as "a square meal," so to complete the bill of fare we may proceed to discuss the milk. A table is given in the Appendix showing the estimated supply of milk in all forms available for consumption during the past ten years. The yearly averages for recent years are as follows :—

Period.	Average Annual Supply of Milk from Cows in United Kingdom.	Average Annual Net Imports of Butter, Cheese, and Condensed Milk, as Raw Milk.	Average Annual Total Supply.
	Gals.	Gals.	Gals.
1892–94	1,447,199,000	954,688,000	2,401,887,000
'93–95	1,425,255,000	1,017,484,000	2,442,739,000
'94–96	1,418,620,000	1,098,459,000	2,517,079,000
'95–97	1,425,662,000	1,177,434,000	2,603,096,000
'96–98	1,437,412,000	1,226,848,000	2,664,260,000

In connection with the table showing the supply of milk, I may point out that although calculations have been made of the home production of butter and cheese they are, owing to the absence of trustworthy data, necessarily conjectural, and I have therefore thought it desirable to show the consumption of dairy produce in terms of milk. The home production is based on an assumed yield per cow of 360 gallons yearly, this being the figure arrived at after careful inquiry by Mr. Rew, and published by him in a paper read before this Society in 1892. Mr. Rew applied an estimate of 400 gallons to 90 per cent. of the cows enumerated, the remaining 10 per cent. being regarded as non-productive; this gives a net average yield for the entire stock of 360 gallons.

In some quarters this output may be thought too low, but it must be remembered that it does not profess to represent the average volume produced by dairying herds, but by the entire cow stock of the United Kingdom; so that the low milking capacities of certain breeds kept in different parts of the country are also taken into consideration. The net imports of butter and cheese have been converted into milk at the rate of $2\frac{3}{4}$ gallons to 1 lb. of butter, and 1 gallon to 1 lb. of cheese; condensed milk has been reduced to milk on the assumption that 1 unit by weight of condensed milk is equivalent to 4 units of raw milk. No account has been taken of the small imports of raw milk and cream, nor has any allowance been made for imported margarine, in the manufacture of which a certain quantity of milk is employed. On the basis of the several estimates used in the preparation of this table our average annual consumption of milk in all forms amounts to about 65 gallons per head, of which 36 gallons, or 55 per cent., are home produce.

To complete this short preliminary review of our present position as producers of food, a few tables have been inserted in the Appendix showing the home production and imports of barley, oats, beans, and pease, all of which contribute indirectly to the maintenance of the supplies of meat and milk. Of barley the annual provision from all sources amounts roughly to 15,000,000 quarters, 60 per cent. being the product of the soil of this country. In the case of oats we produce nearly 80 per cent. of the total supply, which amounts to 27,000,000 quarters yearly. Beans and pease may be taken together; the home production of these food-stuffs represents on the average about 50 per cent. of the entire annual available supply.

In the foregoing paragraphs I have endeavoured to indicate briefly the extent to which we are at present feeding ourselves so far as concerns such fundamental articles of diet as bread, meat, potatoes, and milk. In the case of bread it has been shown that our own contribution in the form of wheat is equivalent to less than 25 per cent. of our annual consumption; of our yearly requirements of meat we provide about 62 per cent.; of milk (including milk products as milk) about 50 per cent.; and of potatoes we produce nearly the whole. But this statement of the position is obviously too favourable, inasmuch as we have yet to take into account the fact that the live stock of this country is supported to a considerable extent on feeding-stuffs grown abroad. Moreover our production of wheat, potatoes, and other crops is dependent in part upon imported fertilisers. The second portion of this paper will deal, therefore, with the question of the dependence of our live stock upon imported feeding materials, and with the results

of some calculations intended to show these imports, as well as those of the articles of food we have discussed above, in terms of "acres."

II.—*Imports of Food-Stuffs in Terms of Acres.*

In order to present as far as possible a moderate view of the existing situation, I have thought it well in this branch of my inquiry to deal with the average imports of the five years 1894-98 rather than for a shorter interval. An average taken upon the past three years might afford a nearer indication of the actual position, but, after examining the trade returns of our own and other countries, I have come to the conclusion that the quinquennial figures yield results which, on the whole, cannot be challenged as exaggerating the real state of affairs.

Among imported articles used wholly or partly as feeding stuffs the principal are barley, oats, maize, beans, pease, oil cakes, oil seeds, and hay, and to these may be added the minor imports of rye, buckwheat, and meals of various kinds. The net imports of these materials for each of the past ten years are given in Tables VII and VIII. The average net annual importation of each of them for the five years 1894-98 is shown below :—

Average Annual Imports, 1894-98.

	Cwts.		Cwts.
Barley	24,012,000	Cotton seed.................	7,810,000
Oats (including oatmeal)	16,461,000	Linseed	7,317,000
		Rape seed	883,000
Rye	997,000	Linseed cake................	3,880,000
Beans and pease........	5,943,000	Cotton seed cake	2,140,000
Maize (including maize meal)	46,741,000	Other oil „	120,000
Buckwheat	149,000	Hay	2,870,000

It is difficult to arrive at any very exact appreciation of the volume of such materials converted into meat and milk, inasmuch as a certain quantity of some of the articles enumerated is used for other purposes. For example, imported oats, maize, and beans enter in different proportions into rations for horses; barley and maize are used in the brewing and distilling industries; and these grains, as well as several of the other products mentioned above, are employed as poultry foods, in the manufacture of some proprietary preparations, and in other directions. The absence of statistics of the number of horses, other than those employed in agriculture, and of the numbers of poultry kept in this country, makes it impossible to arrive at any satisfactory estimate of the amount of imported fodder consumed by these classes of live-stock, as distinct from the consumption by cattle, sheep, and swine.

So the figures relating to feeding-stuffs must therefore be con-
sidered in their bearing on the maintenance of live-stock of all
kinds, and not solely in their relation to the home production of
meat and milk.   The inclusion of horses and poultry does not, I
think, seriously affect the results of the inquiry upon which we are
engaged.   A large number of horses are employed in the cultiva
tion of the soil upon which the food is produced, and may,
accordingly, be justly regarded as necessary agents in its production.
As to poultry, the consumption of imported grain in poultry
yards cannot be an item of any magnitude, and, in any case,
the amount so consumed eventually contributes to the supply of
human food; and, furthermore, if the necessary data had been
available, poultry might have been properly included within the
scope of this inquiry as forming part of the existing, or in
substitution of a larger, provision of meat.   By including horses
and poultry, the only disturbing factors for which allowance need
be made are the quantities of the several imported materials
consumed in various manufactures.

The next step is to estimate what proportion of the imports
mentioned is consumed by live-stock.   Barley and maize are
employed in brewing and other industries as well as for fodder.
As to the former cereal there can be little doubt that the grain
received from Russia is, owing to its inferiority and cheapness,
used almost entirely as feeding material for stock, and it is probable
that some portion of the receipts from Roumania and Turkey are
utilised in a similar direction.   For our present estimate, then, it
will be safe to treat as feeding barley the whole of the consignments
from the first-named source.   These on the average of the five
years amounted to 11,947,000 cwts. yearly.

In the case of maize some allowance must be made for the
relatively small demand for the cereal in the manufacture of
proprietary articles and confectionery, as well as in the brewing or
distilling industries.   An indication of the extent of its employ-
ment in the brewing trade is furnished in a return issued by the
Department of Inland Revenue,[1] and it may be assumed that this
and other industries do not absorb at the most more than 10 per
cent. of the total supply.   On this assumption the average quantity
of maize imported annually for consumption by live-stock has
amounted in the past five years to 42,000,000 cwts.   The imports
of beans and pease include some varieties used for human consump-

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[1] H.C. 83. Brewers' licences. The return shows that the quantity of rice,
flaked maize, and similar preparations used in the beer brewed in the United
Kingdom in the year ended 30th September, 1897, was 747,063 cwts.; 194,944
bushels of unmalted corn, and 2,569,457 cwts. of sugar and its equivalents were
also employed, and these materials may have included a small quantity of maize
and maize glucose.

tion, but so far as these products are concerned it will be quite safe to estimate the quantity employed as fodder as constituting at least 80 per cent. of the supply of each of them, and this gives us 4,754,000 cwts.

Hay and oil cake present no difficulties. The entire importation of these articles may be treated as forming part of the supply of feeding-stuffs. In the case of oats a deduction of 10 per cent. may be made for the small quantities used in proprietary goods and in other ways.

Imported oil seeds are largely employed in the manufacture of cakes and feeding-meals, after the greater part of the oil has been extracted. According to statements furnished in 1892 to the Departmental Committee on Fertilisers and Feeding Stuffs, the amount of cake produced from imported oil seed of all kinds, allowing for the extraction of the oil and waste in manufacture, represents approximately 50 per cent. of the weight of the seed. On the score of moderation I have adopted a ratio lower by 10 per cent., and have assumed that the amount of cake produced is equivalent to 40 per cent. of the weight of the seed imported.

With the foregoing reservations and allowances, an estimate of the average quantities of the principal materials imported annually for the maintenance of the live-stock of the United Kingdom during the past five years furnishes the following results :—

	Cwts.	Bushels.
Barley	11,947,000	= 26,757,000
Oats................................	14,815,000	= 42,546,000
Rye	997,000	= 1,860,000
Beans	2,785,000	= 4,837,000
Pease	1,969,000	= 3,446,000
Maize	42,067,000	= 78,525,000
Cotton seed, as cake ...	3,124,000	....
Linseed, ,, ...	2,927,000	....
Rape seed, ,, ...	353,000	....
Linseed cake	3,880,000	....
Cotton seed cake	2,140,000	....
Other oil ,, ...	120,000	....
Hay	2,870,000	....

From these figures it would appear that we import annually nearly 90 million cwts. of feeding stuffs for the maintenance of our live-stock, and of this quantity by far the greater portion is utilised in the home production of meat and milk.

Let us now estimate what this large importation represents in terms of acres, or, in other words, what area of land would be required to grow the whole of the imported fodder materials on the basis of the average yields per acre secured in the United Kingdom. The results of a calculation of this kind for feeding-

grains and hay are shown below.   The weight of a bushel of grain has been taken as 50 lbs. for barley; 39 lbs. for oats; 64 lbs. for beans; $63\frac{1}{2}$ lbs. for pease; and 60 lbs. for rye and maize.

	Bushels.	Average Yield per Acre in the United Kingdom.	Acres.
Barley	26,757,000	33·65, say 34	= 787,000
Oats.............................	42,546,000	39·98, ,, 40	=1,064,000
Beans	4,837,000	27·13, ,, 27	= 179,000
Pease	3,446,000	26·04, ,, 26	= 133,000
Rye	1,860,000	,, 30	= 62,000
Maize in equivalent of barley	94,230,000	33·65, ,, 34	=2,771,000
	Cwts.	Cwts.	
Hay.............................	2,870,000	30	95,000
			5,091,000

Before dealing with oil cakes and oil seeds, I should observe that maize is a crop which, it is generally believed, could not be successfully grown in this country, and the imports of this grain have therefore been converted into barley on the basis of their respective feeding values per unit of weight of grain.[2]

Turning now to oil cake, I may explain that in order to economise the land which would be required for the production of this class of feeding-stuffs, all the cake has been converted into its feeding equivalent of linseed. Among cattle foods linseed possesses the largest feeding value per unit of weight; that is to say, to produce a given weight of meat, a smaller weight of linseed is required than of any other feeding-stuff. A statement of the methods of conversion employed in dealing with each variety of oil seed is given in the Appendix (Table IX).

The oil cake converted into linseed in this way works out as follows :—

		Equivalent if Fed as Linseed.	Yield of Linseed per Acre.	Acres.
	Cwts.	Bshls.	Bshls.	
Linseed cake	6,807,000	=11,765,000	20	= 588,000
Cotton seed cake	5,264,000	= 7,799,000	20	= 390,000
Rape ,, ...	353,000	= 366,000	20	= 18,000
Other oil seed cake, principally rape	120,000	= 124,000	20	= 6,000
	....	....	....	1,002,000

[2] See article by Sir J. Lawes and Sir H. Gilbert on "The Valuation of Unexhausted Manures," Journal of the Royal Agricultural Society, vol. viii, part iv, 1897; also vol. vii of "Rothamsted Records;" also the Agricultural Note Book. Primrose McConnell, note on "Food Equivalents."

Then for fodder grains, hay, and oil cakes we obtain the following result in terms of acres :—

	Acres.
Imported grains and hay	5,091,000
„ oilseed cakes	1,002,000
	6,093,000

Thus, on the basis of the average yields per unit of area in this country, the annual imports of the principal kinds of feeding-stuffs would represent at least the produce of about 6 million acres. To complete this aspect of the question of our food supply we have yet to estimate what productive area is represented by the imports of wheat, meat, and dairy products. Potatoes may be excluded as the imports are so small.

The net annual importation of wheat in 1894-98 amounted to 179,368,000 bushels, and this quantity would be the produce of 5,979,000 acres at the estimated average yield of the United Kingdom (30 bushels per acre).

For meat and milk the calculations are not so simple. The average annual net importation of beef, mutton, and pork and of milk in all forms (except margarine and fresh milk and cream) in the five years with which we are concerned were as follows :—

	Tons.
Beef and veal	339,000
Mutton and lamb	170,000
Pigmeat	335,000
	Gallons.
Milk in all forms	1,160,675,000

In the first place I propose to omit pigmeat, because if we could grow in this country the whole of the imported feeding-stuffs referred to above, as well as the imported milk, there would be a considerable amount of offal and waste material derived from the manipulation of the articles which might be converted into pork. It is not likely that the amount of pork produced in this way would be at all equivalent to the quantity imported annually; but I have found it so difficult to determine satisfactorily the value of such offal and waste as food for swine, that to avoid any exaggeration it seemed to me to be advisable to exclude imported pigmeat from this estimate.

The question, then, is : what area would be required to furnish the imported beef, mutton, and milk? In accordance with the course adopted throughout this paper let us take a moderate view of the situation, and inquire what area would be necessary under the best conditions. On this point I have consulted a number of

well-known practical agriculturists and other authorities. The question I put to them was : what extent of land of the best quality on a mixed farm would be required to produce annually 1,200 lbs. of beef, 112 lbs. of mutton, and 500 gallons of milk respectively ? Summaries of the answers received to this inquiry are given in the Appendix. From them, and from other sources of information, the following estimates have been derived of the extent of land requisite in each case :—

	Acres.
1,200 lbs. of beef	6·5
112 ,, mutton	0·64
500 gallons of milk	2·0

If these standards are adopted, the imports of beef, mutton, and milk respectively represent the produce of the under-mentioned areas :—

		Acres.
	Tons.	
Beef	339,000	4,108,000
Mutton	170,000	2,176,000
	Gallons.	
Milk	1,160,675,000	4,643,000
		10,927,000

The figures relating to wheat, feeding-stuffs, meat, and milk, may now be brought together. Expressed in terms of acres our imports of these commodities furnish the following results :—

	Acres.
Wheat	5,979,000
Beef	4,108,000
Mutton	2,176,000
Milk	4,643,000
Feeding-stuffs, mainly for conversion into meat and milk	6,093,000
	22,999,000

Now this estimate of 22,999,000, or in round numbers 23,000,000 acres, is a moderate one. On the average yields obtained from the soil, good and indifferent alike, of this country, the extent of land required to produce our present annual imports of the articles of food with which we have been dealing would undoubtedly be larger than the acreage shown above. The full significance of the figures is better appreciated when it is remembered that the total area of land and water in the United Kingdom is 77,671,000 acres, and that the acreage under crops

and grass is about 47,800,000 acres. Thus it is obvious that we could not add to our productive surface anything approaching the area represented by the imports of wheat, meat, and milk. There remains, of course, the possibility that our dependence upon imported supplies of food might be lessened by again bringing under the plough land formerly arable and now occupied by grass. But while an extension of the grass area at the expense of the arable may entail a loss of productive power, it must not be forgotten that the less fertile land is generally the first from which the plough is withdrawn, and it scarcely needs demonstration that whatever may be that loss in this country, its recovery would carry us but a short way on the road towards 23,000,000 acres.

On the other hand, some writers seem to think that the extent of available land need not be considered : that by making radical changes both in our methods of farming and in our social organisation, the productivity of the soil of this country might be increased sufficiently to enable us to feed ourselves. But advocates of such reforms as " thorough cultivation," or " one man one " potato patch," or " universal spade husbandry," usually ignore the existence of the law of diminishing returns. Every bushel yielded beyond a certain limit has involved a larger and less profitable expenditure of labour and capital, and this may be continued until the margin is on the wrong side. Ideal yields and cheap food are incompatible. Hence, to the farmer as a man of business and not as an idealist it is not a question of what he could produce by labour of love, but of what it will pay him to produce. And whatever view may be held as to the shortcomings of British agriculture, we may claim without vanity that it is on the whole more productive than that of any other country, in spite of any advantages that may be supposed to exist in foreign systems of farming or of land tenure. This point, however, brings us to the third part of my inquiry, which is devoted to a comparison of the position of the United Kingdom with that of Belgium, France, and Germany.

III.—*Comparison of the position of the United Kingdom and other Countries.*

In the first place I would direct your attention to the following table, which shows the density of population and the cultivated area of each of these countries and of the United Kingdom.

	Density of Population per Square Mile.	A. Total Area.	B. Cultivated Area or Area of Crops and Grass.	C. Arable Area.	B as percentage of A.	C as percentage of B.
		Thousands of acres.	Thousands of acres.	Thousands of acres.		
England and Wales	538	37,315	27,521	12,342	74·0	44·9
United Kingdom	332	77,671	47,722	19,744	61·5	41·4
France......................	187	130,557	82,494	62,700	63·2	76·0
Belgium	571	7,276	4,459	3,477	61·3	78·0
Germany..................	260	133,500	80,442	63,653	60·3	79·1

Note.—In this table "cultivated area" is the area included in the British Agricultural Returns, under the term "total area under all kinds of crops, bare "fallow, and grass," less the area under small fruit, which, as well as orchards, market gardens, &c., cannot be conveniently compared with the similar areas abroad. Vineyards are included in the cultivated area. The "arable area" has been taken as the cultivated area less permanent pasture and vines. "Rough grazings" are excluded from the cultivated area, but it is not certain that some of the poorer grass land denominated "rough grazings" in one country might not be considered as "pasture" in another. It should further be noted that the British returns take no account of holdings not exceeding an acre, whereas in other countries it is not always clear whether such small properties are included or not; in Germany there is, however, no limit of size, but the small gardens attached to houses have been excluded in the above table.

A remarkable feature brought out by this table is the relatively small proportion of ploughed land in the United Kingdom as compared with that in the other countries named. In connection with the arable acreage, it should be noted, however, that in France it includes as much as 8,200,000 acres, or 13 per cent. of bare fallow; in Germany, too, the bare fallow amounts to 3,800,000 acres, or 6 per cent. of the available surface; while in Belgium and the United Kingdom the proportions are only 1·7 per cent. (77,000 acres) and 1·9 per cent. (369,000 acres) respectively.

Belgium.

Belgium presents many features of interest to us. She has a density of population exceeding our own, and although her ports are not entirely free to imports of food, yet all grains except oats are admitted duty free. On oats there is a duty of 3*s.* 6*d.* per quarter, and on flour of 9*d.* per cwt.[3] Unfortunately, complete figures relating to her position as a producer are available for

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[3] The other duties on articles of food are as follows: live cattle, 1*s.* 2*d.* to 2*s.* per cwt. live weight; sheep, 1*s.* 6*d.* each; fresh meat, 6*s.* to 12*s.* per cwt.; pigs, bacon, and hams, free; butter, 8*s.* per cwt.; and cheese, 4*s.* 9*d.* per cwt.

only a single year, 1895. Estimates are published annually for later years, but these are all based on the assumption that the acreage under the various crops remains constant at the level of that year. The fallacy of this assumption may be illustrated by the fact that until the publication of the results of the Agricultural Inquiry of 1895, the production of wheat in each year from 1881 to 1897 inclusive, was calculated on the acreage as ascertained by the Inquiry of 1880, viz., 681,500 acres, but when the Reports on the later investigation were published last year, it was found that the wheat area had fallen to 445,500 acres, and it is evident from the growth of the imports of wheat that the loss of 240,000 acres was the result of a decline which had been in progress throughout the interval between the two inquiries.

With the aid of the figures for 1895, the supplies per head of the principal grains and potatoes in 1896 would work out as follows :—

Belgium.

Crop.	Home Production, 1895.	Net Imports, 1896.	Available Supply after Deducting Seed.	Supply per Head.		
				Home.	Imported.	Total.
	Qrs.	Qrs.	Qrs.	lbs.	lbs.	lbs.
Wheat...............	1,596,000	4,781,000*	6,249,000	109·0	300·0	409·0
Spelt	224,000	—	200,000	15·0	—	15·0
Rye	2,319,000	198,000	2,307,000	156·0	15·0	171·0
Barley...............	476,000	1,274,000	1,721,000	28·0	78·0	106·0
Oats..................	3,084,000	456,000	3,363,000	140·0	22·0	162·0
Beans and pease	237,000	65,000	282,000	17·0	5·0	22·0
	Cwts.	Cwts.	Cwts.			
Buckwheat	95,000	97,000	182,000	1·4	1·7	3·1
Maize	Inconsiderable.	4,124,000	4,124,000	—	71·0	71·0
Mixed corn........	617,000	—	558,000	10·0	—	10·0
	Tons.		Tons.			
Potatoes	2,633,000	†	2,339,000	807·0	—	807·0

* Including small quantities of spelt and mixed corn.
† Net export 9,000 tons.

The figures in the above table apply only to a single year, but they are presented here as affording the only satisfactory criterion whereby to assess the measure of probability to be attached to statements relating to the actual capacity of Belgium as a self-feeding nation. The *data* furnished by the Inquiry of 1895, viewed in the light of the later annual reports of the Provincial Commissions, and of the influences which may have affected the crops since that year, will serve as a foundation upon which to base a rough estimate of the average annual production of the

principal cereals in the past five years. The first point to be determined is whether there has been any marked variation in the acreage under these crops since 1895. If the areas under wheat, rye, and oats as ascertained in that year and in 1880 are examined, it will be found that the wheat acreage alone exhibited any remarkable change, as the following details show :—

	1880.	1895.
	Acres.	Acres.
Wheat	681,552	445,531
Oats	616,230	614,274
Rye	685,771	699,739
Potatoes	492,412	456,187

With regard to any further modifications that may have occurred subsequent to 1895, it may be assumed, I think, that there has been little change in the acreage of oats and rye, as neither of these grains are subjected to much external competition. In the case of wheat the circumstances are a little different ; the economic conditions affecting the Belgian sowings of this grain are very similar to those influencing the same crop in this country. It will be noticed that between 1880 and 1895 the Belgian acreage declined by 35 per cent.; whereas in the same interval there was a contraction in the wheat fields of the United Kingdom amounting to 52 per cent. The greater reduction in this country was, however, due partly to climatic causes. Up to 1894 the diminution represented much the same proportion as in Belgium, but between 1894 and 1895 there was in the United Kingdom a shrinkage of 25 per cent., which was attributed largely to the fact that the seed time was interrupted by the unusually severe weather in the winter and spring of 1894-95. In the three years which have elapsed since 1895, there has been in this country a recovery amounting to 48 per cent. on the acreage of that year. Had the earlier process of contraction proceeded here at the same slow rate as in Belgium, the extent of the reaction after 1895 would have been equivalent to only 9 per cent. on the area of that year. It is, therefore, probable that the Belgian wheat fields may have regained lost ground since 1895 to the extent of at least about 9 per cent. on the acreage then returned. If this should be the case, the average wheat area for 1894-98 would approximate to 466,000 acres. Potatoes are not likely to have shown much change, judging from the slight variation which appears to have taken place in the fifteen years 1880-95.

Turning now to the question of the produce per acre, I do not think that the yield as ascertained in the Inquiry of 1895 differs

very much from the average rates of production, at least in so far
as concerns wheat and rye. To judge from the yearly reports of
the Provincial Commissions, there were, at any rate, no abnormal
climatic conditions which tended to reduce the output of these
crops or of potatoes below the level of subsequent seasons. On
the other hand, the annual estimates of the local bodies would
show for oats a much larger average yield in 1894-98 than that
returned in 1895 (46·5 bushels against 40·2). But it is difficult to
accept these provincial estimates with confidence in view of the
fact that in 1895 they made the produce of oats 47·4 bushels,
whereas, according to the more precise official inquiry of that
year, it was 40·2 bushels. There is, however, good reason to
suppose that this crop yielded more abundantly than usual in 1897
and 1898, as was also the case in this country, and that the greater
production of those years may make the average for 1894-98
higher than the yield of 1895. In the United Kingdom the
average production for the five years was 3·4 per cent. above the
estimated yield of 1895. If the same rate of increase took place
in Belgium, the average for 1894-98 would be 41·6 bushels.

With these adjustments the average annual supply of the
principal grains and potatoes would work out as follows:—

Belgium.

Crops.	Average Annual Home Production, 1894-98.	Average Annual Net Imports, 1894-98.	Average Annual available Supply after deducting Seed.	Supply per Head.		
				Home.	Imports.	Total.
	Qrs.	Qrs.	Qrs.	lbs.	lbs.	lbs.
Wheat..............	1,672,000	4,384,000*	5,922,000	113	324	437
Spelt	224,000	—	200,000	15	—	15
Rye	2,319,000	118,000	2,227,000	155	9	164
Beans and pease	237,000	65,000	282,000	16	5	21
Barley...............	476,000	1,223,000	1,670,000	27	75	102
	Cwts.	Cwts.	Cwts.			
Oats....................	8,898,108	⎫				
Maize	—	⎬ 5,537,000	14,027,000	147	95	242
Buckwheat........	95,000	⎭				
Mixed corn........	617,000	—	558,000	9½	—	9½
	Tons.		Tons.			
Potatoes	2,633,000	†	2,319,000	799	—	799

* Including spelt and mixed corn.
† Net export 29,000 tons.

From a review of all the available evidence, I am disposed to
think that the latter table indicates approximately the average
supplies of the products named.

As Belgium is sometimes held up for our emulation as an
example of a country which, owing to the perfect cultivation of

its soil, is almost able to meet the food requirements of its entire population,[4] it may be useful to show here our own annual average production and supplies of cereals and potatoes in the same period :—

United Kingdom.

Crops.	Average Annual Home Production, 1894-98.	Average Annual Net Imports, 1894-98.	Average Annual available Supply after deducting Seed.	Supply per Head.		
				Home Produce.	Imports.	Total.
	Qrs.	Qrs.	Qrs.	lbs.	lbs.	lbs.
Wheat...............	7,210,000	22,421,000	29,165,000	81	273·0	354·0
Barley	9,469,950	6,723,000	15,434,000	88	68·0	156·0
Oats....................	21,608,000	5,909,000	25,398,000	154	47·0	201·0
Beans and pease	1,482,000	1,300,000	2,643,000	17	17·0	34·0
Rye*	304,000	233,000	510,000	3	3·0	6·0
		Cwts.	Cwts.			
Maize	—	46,741,000	46,741,000	—	133·0	133·0
Buckwheat........	—	149,000	149,000	—	0·4	0·4
	Tons.	Tons.	Tons.			
Potatoes	5,664,000	169,000	5,132,000	282	9·0	291·0

* The home production is calculated on an estimated yield per acre of 27½ bushels.

The extent to which the supplies for the populations of the two countries are made up from the home production and from imports is as follows : 100 is taken to represent the supplies for all purposes per head in each case :—

	Belgium.		United Kingdom.	
	From Home Production.	From Imports.	From Home Production.	From Imports.
Wheat	26	74	23	77
Rye	95	5	50	50
Barley	26	74	56	44
Oats, buckwheat, and maize............	61	39	46	54
Potatoes	100	—	97	3

As regards meat there appear to be few estimates of the Belgian consumption to which any great faith can be attached. According to one authority,[5] whose figures correspond more nearly with what one would expect from the number of live-stock kept in the country, and from the course of meat imports, the average quantity of meat of all kinds consumed annually is about 70 lbs.

[4] *Vide* "Fields, Factories, and Workshops," chapter on the Possibilities of Agriculture. By Prince Kropotkin : Hutchinson and Co.
[5] " Veröffentl. d. Kaiserl. Gesundheitsamts," 1892.

per head. Of this $7\frac{1}{2}$ lbs., or 11 per cent., is imported, and 90 per cent. home produce. For the United Kingdom, it will be remembered, the percentages in the same order are 34 for the imports and 66 respectively.

Germany.

Notwithstanding a rapid growth of population, accompanied by a remarkable development of manufacturing industries, Germany still continues, with the aid of immoderate protection,[6] to produce on her own soil the larger portion of the food consumed within her borders.

Nevertheless the agitation of the agrarian classes for more protection, the diversion of the productive energy of the population from agricultural to other industrial channels, and the slowly increasing imports of cereals, may all be taken as indications that the present position of the country in respect of food supply will with difficulty be maintained under existing conditions. Further additions to the fiscal restrictions may impede for a time, but cannot permanently arrest, the movement towards increased importation. That the demands of the growing urban communities for cheap food must eventually constitute an important factor in the settlement of this question, is evident from the results of the last occupation census. At the census of 1882 the number of persons engaged in agriculture (including inland fishing and forestry) represented 46·71 per cent. of the entire occupied population of the country; but in 1895 the agricultural ratio had fallen to 39·92 per cent. The rapid growth of the general population is shown by the official estimates for the years 1887 and 1897 : in the former year the number of inhabitants is given as 47,625,000, and in 1897 it had risen to 53,514,000, an increase of nearly 5,889,000, or over 12 per cent. in ten years.

The annual average production and net imports of cereals and potatoes based on the official estimates for the past five cereal years, are given below :—

[6] The German import duties on the principal agricultural products are as follows:—

	s.	d.			s.	d.	
Wheat and rye	7	7	per qr.	Cattle, up to $2\frac{1}{2}$ years	5	–	each
Barley	3	$7\frac{3}{4}$	,,	Oxen	25	6	,,
Oats	3	11	,,	Fresh beef	7	$6\frac{1}{2}$	per cwt.
Maize	–	$9\frac{3}{4}$	per cwt.	Sheep	1	–	each
Butter	8	2	,,	Fresh mutton	7	$6\frac{1}{2}$	per cwt.
Cheese....7s. 7d. to	10	2	,,	Swine	5	–	each
Potatoes..............		Free		Fresh pork	8	7	per cwt.
Cows and steers....	9	–	each				

Crops.	Total Home Production.	Net Imports.	Available for Consumption after Deducting Seed.	Supply available per Head.		
				Home Grown.	Imports.	Total.
	Qrs.	Qrs.	Qrs.	lbs.	lbs.	lbs.
Rye	32,480,000	3,728,000	31,551,000	250	34	284
Wheat	13,807,000	4,965,000	19,114,000	110	45	155
Spelt	1,749,000	—	1,447,000	11	—	11
Barley	13,334,000	5,676,000	18,677,000	88	43	131
Oats	36,865,000	2,779,000	35,141,000	189	16	205
	Cwts.	Cwts.	Cwts.			
Buckwheat	1,932,000	506,000	2,104,000	3·4	1·1	4·5
Beans, pease	10,725,000	2,261,000	11,036,000	18	5	23
Maize	6,914,000	18,005,000	24,756,000	15	38	53
Mixed grain	13,597,000	—	12,165,000	26	—	26
	Tons.	Tons.	Tons.			
Potatoes	29,854,000	541,000	24,788,000	1,016	2	1,018

In connection with this table it should be observed that German agriculture is generally less productive than that of the United Kingdom. The average yield of the principal cereals are from 20 to 25 per cent. below those secured in this country.

An embarrassing number of calculations are to be found of the consumption of meat in the Empire. An official estimate published in 1898[7] puts it at 99 lbs. per head, of which 95 lbs. is derived from the home stock and 4 lbs. is imported. This ration consists of 43 lbs. of beef, $3\frac{1}{2}$ lbs. of mutton, and $52\frac{1}{2}$ lbs. of pork.

Milk, on the other hand, does not appear to have proved much of a stimulant to German statisticians, if one may judge from the paucity of estimates relating to its production. It is difficult to reconcile any of them with one's preconceived notions of the superiority of the British cow. A contributor to the "Milch "Zeitung,"[8] who is evidently an expert on the subject, shows that the quantity available for human consumption would represent a yield of 440 gallons per cow. An estimate made for the Bavarian dairy herds in 1882[9] also gives an average of 440 gallons for the cows in that country. Dr. Fleischmann in an elaborate inquiry completed in the same year,[10] furnishes a number of statements of the milk yielded by the herds supplying co-operative dairies, and the average for 20,000 cows works out to 500 gallons. In the face of these figures I have not ventured to adopt a lower net yield than 360 gallons per cow, and this on the cow stock enumerated

[7] *Vide* "Entwurf eines Gesetzes betreffend die Schlachtvieh- und Fleisch- "beschau." No. 138, Reichstag 10, Legislation-Periode 1, Session 1898-99.

[8] "Milch Zeitung," No. 33, 17th August, 1895.

[9] "Die Landwirthschaft in Bayern." Munich. Verlag von R. Oldenbourg.

[10] Fleischmann, "Bericht des Milchwirthschaftlichen Vereines." Bremen: Druck und Verlag von M. Heinsius, 1882.

at the last census of 1892, less 5 per cent. for draught animals, would give an annual supply of 3,077,000,000 gallons. If we assume that this quantity is the annual average home production for 1894-98, and add thereto the average net imports of butter and cheese, less the exports of condensed milk, which represent another 35,500,000 gallons, the volume available for consumption in the country would amount to 3,112,500,000 gallons yearly, or about 59 gallons per head of the population.

France.

France affords another example of a country in which agriculture may be said to be swathed in protective duties, as the items from the existing tariff quoted in the footnote[11] will show.

The duties are on the whole higher even than the German tariff. In spite, however, of great artificial support, or perhaps as one result of it, French agriculture is less productive than that of Germany. The average yields per acre of the principal cereals are from 30 to 40 per cent. below those to which we are accustomed, so that from a cereal acreage more than four times larger than that of the United Kingdom, the total production of grain is a little more than double the volume grown in this country. But with an almost stationary population, of which a larger proportion than in the case of Germany is engaged in the cultivation of the soil, France has not yet found the demand for food on the part of her people exceed the home resources, supported by a scheme of protection which it is sometimes sought to justify partly by reference to the fact that agriculture still forms the chief pursuit of nearly half of her occupied population, and partly by international considerations. (The latter constitute an element which may also have some bearing on the attitude of Germany towards this question of self-maintenance, but in her case the needs of the rapidly growing manufacturing classes must ultimately modify her concessions to considerations of this character.)

According to the results of the last French census, about 45 per cent. of the occupied inhabitants were returned as engaged in

[11] The French duties on the principal agricultural products are as follows :—

	s.	d.			s.	d.	
Wheat	12	2	per qr.	Cattle	4	-¾	per cwt.
Barley	4	4	,,	Beef, fresh	10	2	,,
Oats	3	5	,,	Sheep	6	3½	,,
Maize	1	2½	per cwt.	Mutton, fresh	13	–	,,
Butter....8s. 3d. to	12	3	,,	Pigs	4	10	{ per cwt. live weight
Cheese..4s. 10d. ,,	6	1	,,				
Potatoes	–	2	,,	Fresh pork	7	4	per cwt.

agriculture. The stationary character of the general population is shown by the annual official estimates; these give the number of inhabitants in 1887 as 38,320,000, and in 1897 as 38,269,000.

Bearing these preliminary observations in mind, we may now proceed to examine the figures of the average annual production and imports of grain and potatoes.

Crops.	Home Production.	Net Imports.	Available for Consumption after deducting Seed.	Supply available per Head.		
				Home Grown.	Imported.	Total.
	Qrs.	Qrs.	Qrs.	lbs.	lbs.	lbs.
Wheat and spelt	37,597,000	4,000,000	36,868,000	413	50	463
Rye	7,942,000	79,000	6,899,000	66	1	67
Barley..............	5,299,000	894,000	5,572,000	49	9	58
Oats.....................	28,980,000	2,121,000	27,943,000	212	17	229
Maize	3,401,000	1,526,000	4,480,000	38	19	57
Buckwheat	3,187,000	—	2,781,000	35	—	35
Mixed corn........	1,350,000	—	1,241,000	16	—	16
Beans and pease	1,590,000	215,000	1,569,000	18	3	21
	Tons.	Tons.	Tons.			
Potatoes	12,171,000	*	9,686,000	568	—	568

* Net export of 98,000 tons.

Statements published in the "Report on the Decennial Inquiry"[12] give the estimated consumption of meat in France in 1891 (exclusive of home grown meat of goats, mules and donkeys consumed for food) as amounting to 78 lbs. per head, of which about 42 lbs. consisted of beef, 9 lbs. mutton, 26 lbs. pork, and 1 lb. nondescript. Since that year a slight decrease has taken place in the number of animals kept in the country, but this has been more than counterbalanced by an increased importation. It is probable that the consumption of meat at the present time amounts to about 80 lbs. per head, of which $76\frac{1}{2}$ lbs. is produced at home and $3\frac{1}{2}$ lbs. imported. This ration includes about 43 lbs. of beef, 10 lbs. of mutton, and 26 lbs. of pork.

With regard to milk, in 1892 5,407,126 milch cows were estimated to have furnished 1,694,000,000 gallons, which, on the supposition that one-tenth of the animals were unproductive, gives an average yield per cow of nearly 350 gallons. For the past five years, the annual average total production of milk is officially estimated at 1,678,000,000 gallons, and the net export of milk in all forms in the same period averaged 123,000,000 gallons yearly, thus leaving 1,555,000,000 gallons for home consumption, or nearly 41 gallons per head of the population.

[12] Résultats Généraux de l'Enquête Décennale de 1892." Paris: Imprimerie Nationale, 1897.

IV.—*Summary.*

The foregoing brief observations on the conditions affecting the position of each country may now be summarised in a few comparative statements showing the supplies of food per head of the respective populations, and proportions contributed from the home production and from imports. From the several estimates to which reference has been made above, we obtain for bread grains, meat, milk, and potatoes the following results :—

	Bread Grains.								
	Wheat.			Spelt.			Rye.		
	Home Produce.	Imports.	Total.	Home Produce.	Imports.	Total.	Home Produce.	Imports.	Total.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
United Kingdom	81	273	354	—	—	—	3	3	6
Belgium	113	324	437	15	—	15	155	9	164
Germany	110	45	155	11	—	11	250	34	284
France	413	50	463	—*	—*	—*	66	1	67

	Meat.			Milk.			Potatoes.		
	Home Produce.	Imports.	Total.	Home Produce.	Imports.	Total.	Home Produce.	Imports.	Total.
	lbs.	lbs.	lbs.	Galls.	Galls.	Galls.	lbs.	lbs.	lbs.
United Kingdom	79	48	127	36	29	65	282	9	291
Belgium	62½	7½	70	—	—	—	799	—	799
Germany	95	4	99	58¼	¾	59	1,016	2	1,018
France	76½	3½	80	41	—	41	568	—	568

* Included with wheat.

It would appear from this table that the average dietary of an inhabitant of the United Kingdom contains a much larger quantity of meat than that of a Belgian, Frenchman or German, but a smaller proportion of bread and potatoes. In Belgium more bread and less meat are consumed than in any of the other countries named, while in France a noteworthy feature is the apparently small consumption of milk. In the case of potatoes the considerable requirements in Belgium and Germany are largely accounted for by their use in the manufacture of spirits and starch.

A further analysis of the figures relating to meat may be of interest as indicative of the degree of popularity of the different varieties in each country. The rations referred to above are made up approximately as follows :—

	Beef.	Mutton.	Pork.
United Kingdom	63	32	35
France............................	43	10	26½
Germany........................	43	3½	54½
Belgium	36	2½	31½

Our inquiry has not extended to grosser forms of animal food of which there is a small consumption abroad, and possibly also in this country. For example, the French official estimates take notice of the meat of the horse, mule, and ass; some of the returns of the municipal abattoirs in Germany also deal with horses and donkeys slaughtered for human food; in Belgium, too, such meats are eaten, and even in our own country a demand for horseflesh for human food is recognised by an Act passed in 1889, in which the expression "horseflesh" is defined as including the flesh of asses and mules. Hippophagy, however, is not extensively practised in any of these countries, probably least of all in the United Kingdom, where, perhaps, it is confined to destitute foreign immigrants. In most cases it is no doubt a taste acquired of necessity rather than of choice.

In connection with these estimates of the consumption of meat and milk, it has already been pointed out that figures purporting to show the home supplies of such articles are misleading, unless due allowance is made for the imported materials utilised in the rearing of the live-stock concerned.

Moreover, such estimates are from their nature usually of a less precise character than those relating to grain, which are, in most cases, based on inquiries repeated at short intervals. Besides, meat and milk are after all merely transformed vegetable food, and a better conception of the real extent to which each country contributes to its own food supply would be obtained from a comparison of the estimate of production of cereals and other vegetable feeding-stuffs, so far as these are recorded. There would, however, be some difficulty in thus ascertaining the human consumption of these products, because some of the articles concerned are also utilised in feeding urban horses and in manufactures. Still, the quantities consumed in these directions are for human requirements, and in an emergency the whole would be available for food. So that a country's contribution of vegetable food-stuffs to its requirements of such materials for all purposes, is a fair indication of the extent of its ability to feed its people. From this point of view a comparison of the capacities of the countries named above, so far as concerns their production of cereals, would furnish the following results. The grains included

in each case are wheat, barley, oats, rye, beans, pease, maize, buckwheat, and mixed corn:—

	Total Production of all Cereals.	Requirements per Head of the Population for Consumption in all forms.	Number of People whose requirements are met by Home Produce.	Number per Cent. of Total Population.
	Mlns. of lbs.	lbs.	No.	
United Kingdom	13,623	884	15,410,000	39
Belgium	3,150	1,022	3,181,000	49
Germany	38,023	895½	42,460,000	80
France	33,020	945	34,941,000	91

These results are sometimes put in a different form by showing the number of inhabitants per 1,000 acres whose requirements of grain are met by the produce of the soil of the respective countries, compared with the density of population in each.   Stated in this form the results would be as follows :—

	Density of Populations per 1,000 Acres.	Number of Inhabitants per 1,000 Acres whose requirements are met by Home Produce.
United Kingdom	519	199
Belgium	893	437
Germany	407	318
France........................	293	267

Such figures are, however, misleading when used, as they sometimes are, to illustrate the relative merits of the agricultural systems of the respective countries.   To show the productivity of a nation's agriculture, account must be taken of the extent of cultivated land required to produce the food for a given number of persons; it is not sufficient to state merely the number of residents in a given area maintained by home produce.

So far we have been dealing with the number of persons deriving their supplies of grain from the home agriculture.   Let us now calculate what area of land is utilised for the production of such supplies for a given number of inhabitants in the several countries :—

	Number of Persons supplied by Home Agriculture.	Number of Acres utilised in producing such Supplies.	Number of Acres utilised for 1,000 Persons.
United Kingdom	15,410,000	8,934,000	580
Belgium	3,181,000	2,086,000	656
Germany........................	42,460,000	36,939,000	870
France............................	34,941,000	36,112,000	1,034

In examining this statement, it must not be overlooked that the requirements per head are larger in Belgium, France, and Germany than in this country. To ascertain the productive capacities of the agriculture of each country, it would be necessary to assume that the supplies required per inhabitant were equal in all cases. Taken on the basis of 884 lbs. per head all round, the acreage employed in supplying the wants of 1,000 persons would work out as follows:—

	Number of Inhabitants supplied at 884 lbs. per Head.	Number of Acres utilised in producing these Supplies.	Acres per 1,000 Persons.
United Kingdom	15,410,000	8,934,000	580
Belgium	3,563,000	2,086,000	585
Germany........................	43,013,000	36,939,000	859
France............................	37,353,000	36,112,000	967

The figures we have just discussed have shown us the extent to which each country contributes to its total requirements of cereals used directly for bread and indirectly for conversion into meat and milk, as well as for other forms of food, and in other directions. Of potatoes, roots, and other green stuffs utilised in the evolution of meat and milk, each country apparently produces sufficient for its needs. To complete this aspect of the position, the following statement has been prepared to show the average annual net imports per head of such materials as are necessary to make up the deficiency in bread-stuffs, meat, and milk, and for other purposes :—

Average Annual Net Imports per Head of the Population, 1894-98.

	United Kingdom.	Belgium.	Germany.	France.
	lbs.	lbs.	lbs.	lbs.
Wheat and wheat flour..	272·6	323·6	45·2	50·0
Barley	68·1	75·2	43·2	9·3
Rye	2·8	8·7	33·9	1·0
Oats	47·0	} 95·4 {	16·4	17·3
Maize	132·6		38·2	19·2
Buckwheat	0·4		1·1	—
Beans and pease	16·9	4·8	4·8	2·9
Oil cake.............................	41·1	17·0	31·0	4·0
Potatoes	9·6	—	2·3	—
Meat, live and dead	47·9	11·6	3·6	3·5
Sugar.................................	83·9	—	—	—
	Galls.		Galls.	
Milk in all forms.............	30·0	—	0·7	—

Sugar is included in the above statement, because among the

fodder roots produced in Belgium, Germany, and France sugar-beet occupies an important place. Each of these countries grows sugar-beet primarily to meet its requirements of sugar, and the pulped roots after the extraction of the sugar serve as useful fodder for stock.

Finally, another factor which should be noticed is the average yearly importation of fertilisers. Owing to the variations in the classification of these articles in the different trade returns, it is not possible to vouch with confidence for the strict comparability of the figures on this point, but, with this qualification, on the total area of crops and grass in each country, the respective net imports of fertilisers seem to amount approximately to the following quantities per acre :—

	lbs. per Acre.		lbs. per Acre.
United Kingdom	13·5	France	7·5
Belgium	5·3	Germany	5·1

The small importation into Belgium is explained by the existence in that country of considerable deposits of phosphates.[13]

In conclusion, I have only to say that this paper is the outcome of an attempt to arrive at some idea of the real position of the United Kingdom, and incidentally of some of her neighbours, in respect of this important question of the maintenance of the food supplies of the population. Some of the estimates employed, especially those relating to the consumption of meat and milk in their finished form, are only approximative; on the other hand, the results based on the estimates of the production and imports of grain and other food-stuffs used directly and indirectly for human food approach more closely to the facts. So far as this country is concerned, it seems to be clear that our dependence on external sources of supply is represented by a volume of food-stuffs which could not, under conditions known to our experience, be economically produced in this country. It might be lessened in some degree if it should be possible in the future to increase the productivity of the soil, but the prospects of much profitable improvement in this direction are bounded by the inevitable law of diminishing returns, and, in the meantime, population grows. Let us stop then with the present; the future, we have been told on very high authority, is in the air, where we may be content to leave it.

I should like to trespass further on the space allotted me to

[13] According to Johnston's " Elements of Agricultural Chemistry," phosphates occur in enormous deposits in the north of France and Belgium. The annual imports into the United Kingdom of phosphates from Belgium averaged 69,000 tons in 1894-98.

express my thanks to those Fellows of the Society and others who have afforded me assistance in the preparation of this paper.   To our Chairman, Major Craigie, I am particularly indebted for many helpful suggestions.   I am also under an obligation to my colleagues, Mr. Rew and Mr. Hooker, and to Dr. Somerville, Dr. Fream, Professor Campbell, Professor Middleton, Principal Hall, Mr. Clay, and Mr. Speir, all of whom have aided me with their knowledge and experience in the elucidation of several of the statistical problems which have arisen in connection with this question of food supply.

APPENDIX.

TABLE I.—*Wheat Supply of the United Kingdom.*

Period.	Average Annual Supply from Home Production, less Seed, 2 Bushels per Acre.	Average Annual Imports, less Exports of Wheat and Wheat Flour as Grain.	Average Annual Total Supply.	Average Annual Supply per Head of the Population.	
				From Home Production.	From Imports.
	Qrs.	Qrs.	Qrs.	lbs.	lbs.
1887–89....	8,461,000	18,391,000	26,852,000	110	239
'88–90....	8,798,000	18,576,000	27,374,000	114	240
'89–91....	8,818,000	19,262,000	28,080,000	113	247
'90–92....	8,635,000	20,521,000	29,156,000	110	261
'91–93....	7,911,000	21,383,000	29,294,000	100	269
'92–94....	7,054,000	21,955,000	29,009,000	88	274
'93–95....	6,420,000	22,896,000	29,316,000	79	283
'94–96....	5,918,000	23,355,000	29,273,000	73	286
'95–97....	6,063,000	22,721,000	28,784,000	74	276
'96–98....	6,391,000	21,664,000	28,055,000	77	261

Note.—It is estimated that the supply of home-grown wheat available in a calendar year would be made up of one-third of the crop harvested in that year, and two-thirds of the crop of the previous year.

TABLE II.—*Meat Supply of the United Kingdom.*

Period.	Average Annual Home Production.	Average Annual Imports, Live and Dead.	Average Annual Total Supply.	Average Annual Supply per Head of the Population.	
				Home Production.	Imports.
	Tons.	Tons.	Tons.	lbs.	lbs.
1887–89....	1,327,000	509,000	1,836,000	81	31
'88–90....	1,355,000	598,000	1,953,000	82	36
'89–91....	1,408,000	661,000	2,069,000	84	39
'90–92....	1,438,000	691,000	2,129,000	85	41
'91–93....	1,423,000	650,000	2,073,000	83	38
'92–94....	1,385,000	667,000	2,052,000	81	39
'93–95....	1,374,000	689,000	2,063,000	79	40
'94–96....	1,388,000	787,000	2,175,000	79	45
'95–97....	1,393,000	871,000	2,264,000	79	49
'96–98....	1,397,000	953,000	2,350,000	78	54

Note.—The home production is based on the assumption that for every 1,000 living cattle of all ages, enumerated annually for the purposes of the agricultural returns, about 67 tons of beef and veal are available for consumption in a year; for every 1,000 living sheep enumerated, 12½ tons of mutton and lamb; and for every 1,000 living pigs, 69½ tons of bacon, ham, or pork. The weight of dead meat represented by imported live animals has been calculated upon the average weight of meat represented by each description of animal imported.

Analysis of TABLE II.

(a.) *Supply of Beef and Veal.*

Year.	Home Production.	Imports, Live and Dead.	Total Supply.	Supply per Head of the Population.	
				Home Production.	Imports.
	Tons.	Tons.	Tons.	lbs.	lbs.
1890	723,000	335,000	1,058,000	43	20
'91	760,000	297,000	1,057,000	45	18
'92 ...	771,000	322,000	1,093,000	45	19
'93	750,000	238,000	988,000	44	14
'94	722,000	299,000	1,021,000	42	17
'95	720,000	285,000	1,005,000	41	16
'96	733,000	356,000	1,089,000	42	20
'97	737,000	387,000	1,024,000	42	22
'98	747,000	370,000	1,117,000	42	21

(b.) *Supply of Mutton and Lamb.*

Year.	Home Production.	Imports, Live and Dead.	Total Supply.	Supply per Head of the Population.	
				Home Production.	Imports.
	Tons.	Tons.	Tons.	lbs.	lbs.
1890	396,000	98,000	494,000	24	6
'91	419,000	96,000	515,000	25	6
'92	421,000	90,000	511,000	25	5
'93	397,000	105,000	502,000	23	6
'94	375,000	134,000	509,000	22	8
'95	372,000	170,000	542,000	21	10
'96	386,000	173,000	559,000	22	10
'97	382,000	182,000	564,000	22	10
'98	389,000	190,000	579,000	22	11

(c.) *Supply of Pigmeat.*

Year.	Home Production.	Imports, Bacon and Hams, and all other Kinds.	Total Supply.	Supply per Head of the Population.	
				Home Production.	Imports.
	Tons.	Tons.	Tons.	lbs.	lbs.
1890	303,000	261,000	564,000	18	16
'91	296,000	255,000	551,000	18	15
'92	227,000	275,000	502,000	13	16
'93	227,000	228,000	455,000	13	13
'94	263,000	263,000	526,000	15	15
'95	294,000	293,000	585,000	17	17
'96	298,000	328,000	626,000	17	19
'97	256,000	366,000	622,000	14	21
'98	258,000	426,000	684,000	14	24

TABLE III.—*Supply of Milk and Milk Products, United Kingdom.*

[In thousands of gallons.]

Period.	Average Annual Home Production, at 360 Gallons per Cow.	Average Annual Net Imports expressed as Milk.				Average Annual Total Available Supply.	Supply per Head of the Population.	
		Butter. 1 lb. = 2¾ Gallons.	Cheese. 1 lb. = 1 Gallon.	Condensed Milk.* 1 Cwt. = 40 Gallons.	Total Milk Imports.		Home Supply.	Imports.
							Galls.	Galls.
1888–90 ...	1,394,858,	548,343,	214,779,	8,609,	771,731,	2,166,589,	38	21
’89–91....	1,426,622,	596,483,	219,178,	9,026,	824,687,	2,251,309,	38	22
’90–92....	1,463,325,	624,645,	231,367,	11,061,	867,073,	2,330,398,	39	23
’91–93....	1,470,625,	657,379,	228,802,	12,223,	898,404,	2,369,029,	39	23
’92–94....	1,447,199,	703,559,	237,615,	13,514,	954,688,	2,401,887,	38	25
’93–95....	1,425,255,	769,594,	233,910,	13,980,	1,017,484,	2,442,739,	37	26
’94–96 ...	1,418,620,	843,336,	240,559,	14,564,	1,098,459,	2,517,079,	36	28
’95–97....	1,425,662,	908,422,	253,254,	15,758,	1,177,434,	2,603,096,	36	30
’96–98....	1,437,412,	947,908,	261,085,	17,855,	1,226,848,	2,664,260,	36	31

* Condensed milk was not separately distinguished before 1888.

TABLE IV.—*Barley Supply of the United Kingdom.*

Period.	Average Annual Acreage.	Average Annual Supply from Home Production.	Average Annual Net Imports.	Average Annual Total Supply available for all purposes.	Percentage of Net Imports to Total Supply.
		Qrs.	Qrs.	Qrs.	
1886–88	2,309,171	9,594,000	4,580,000	14,174,000	32·3
’87–89	2,270,746	9,233,000	4,924,000	14,157,000	34·8
’88–90	2,286,090	9,284,000	5,151,000	14,435,000	35·7
’89–91	2,297,505	9,655,000	4,792,000	14,447,000	33·2
’90–92	2,265,709	9,825,000	4,500,000	14,325,000	31·4
’91–93	2,249,194	9,678,000	5,079,000	14,757,000	34·4
’92–94	2,239,002	9,247,000	6,360,000	15,607,000	40·8
’93–95	2,280,892	9,194,000	7,231,000	16,425,000	44·0
’94–96	2,292,000	9,322,000	7,182,000	16,504,000	43·5
’95–97	2,274,000	9,561,000	6,030,000	15,591,000	38·7
’96–98	2,182,000	9,398,000	6,103,000	15,501,000	39·4

Note.—In estimating the amount of home-grown barley entering into the annual supply, it has been assumed, as in the case of wheat, that the quantity available in a calendar year would be made up of one-third of the crop harvested in that year and two-thirds of the production of the previous year.

TABLE V.—*Oats Supply of the United Kingdom.*

Periods.	Average Annual Acreage.	Average Annual Supply of Home Production.	Average Annual Net Imports.	Average Annual Total Supply available for all Purposes.	Percentage of Net Imports to Total Supply.
		Qrs.	Qrs.	Qrs.	
1886–88	4,323,000	19,991,000	5,617,000	25,608,000	21·9
'87–89	4,231,000	19,849,000	5,907,000	25,756,000	22·9
'88–90	4,138,000	19,987,000	5,716,000	25,703,000	22·2
'89–91	4,122,000	20,674,000	5,479,000	26,153,000	20·9
'90–92	4,154,000	20,967,000	5,402,000	26,369,000	20·5
'91–93	4,253,000	21,044,000	5,618,000	26,662,000	21·1
'92–94	4,384,000	21,307,000	5,414,000	26,721,000	20·3
'93–95	4,480,000	22,072,000	5,375,000	27,447,000	19·6
'94–96	4,437,000	22,167,000	5,853,000	28,020,000	20·9
'95–97	4,338,000	21,629,000	6,078,000	27,707,000	21·9
'96–98	4,194,000	20,844,000	6,164,000	27,008,000	22·8

Note.—In estimating the proportion of home-grown oats entering into the annual supply, it has been assumed that the quantity consumed in a calendar year would be made up of one-third of the crop harvested in that year, and two-thirds of the production of the previous year.

TABLE VI.—*Supply of Beans and Pease, United Kingdom.*

Period.	Average Annual Acreage.	Average Annual Home Production.	Average Annual Net Imports.	Average Annual Total Supply available for all Purposes.	Percentage of Net Imports to Total Supply.
		Qrs.	Qrs.	Qrs.	
1886–88	599,000	1,861,000	1,126,000	2,987,000	37·2
'87–89	581,000	1,910,000	1,155,000	3,065,000	37·7
'88–90	573,000	1,936,000	1,133,000	3,069,000	36·9
'89–91	565,000	2,060,000	1,180,000	3,240,000	36·4
'90–92	552,000	2,036,000	1,300,000	3,336,000	39·0
'91–93	510,000	1,828,000	1,375,000	3,203,000	42·9
'92–94	486,000	1,548,000	1,476,000	3,024,000	48·8
'93–95	467,000	1,440,000	1,449,000	2,889,000	50·2
'94–96	464,000	1,418,000	1,441,000	2,859,000	50·4
'95–97	441,000	1,445,000	1,307,000	2,752,000	47·5
'96–98	426,000	1,430,000	1,152,000	2,582,000	44·6

Note.—The average home production is calculated as one-third of the crop of one year and two-thirds of the crop of the previous year.

The imports are converted from cwts. to quarters at the rate of 64 lbs. per bushel of beans and 63½ lbs. per bushel of pease.

TABLE VII.—*Net Imports of Barley, Oats, Beans and Pease, Maize, Rye, and Buckwheat into the United Kingdom.*

Year.	Barley.	Oats and Oatmeal.	Beans and Pease.	Maize and Maize Meal.	Rye.	Buckwheat.	Hay.
	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.	Tons.
1889	17,338,397	16,142,931	5,173,212	35,883,732	592,024	111,360	*
'90	16,610,144	12,952,165	5,087,565	43,025,134	563,719	96,672	*
'91	17,399,653	16,671,135	6,000,426	26,658,147	408,220	153,947	*
'92	14,207,493	16,136,848	6,833,095	35,392,706	551,048	129,497	61,197
'93	22,809,531	14,109,568	6,120,364	32,926,778	722,815	104,530	261,756
'94	31,125,730	14,961,207	7,398,837	35,365,991	1,005,409	133,084	253,568
'95	23,541,843	15,833,056	6,452,122	34,102,749	942,473	134,358	118,787
'96	22,287,266	18,118,682	6,009,170	51,647,984	977,821	136,433	107,685
'97	18,802,392	16,762,016	5,541,555	54,446,741	1,002,365	167,377	121,390
'98	24,301,185	16,632,467	4,311,713	58,143,404	1,054,969	173,560	116,000

Note.—Oatmeal and maize meal have been converted into grain on the assumption that 72 units of meal = 100 units by weight of grain.

TABLE VIII.—*Net Imports of Oil Seeds and Oil Seed Cake, United Kingdom.*

Year.	Oil Seeds.			Oil Seed Cake.		
	Cotton.	Linseed.	Rape.	Linseed.	Cotton.	Other kinds.
	Tons.	Qrs.	Qrs.	Tons.		
1889	277,374	2,028,282	386,482	250,428		
'90	314,022	1,836,983	185,607	278,616		
'91	350,413	2,130,118	224,169	268,125		
				Tons.	Tons.	Tons.
1892	409,015	1,780,665	231,151	207,413	90,129	11,280
'93	389,756	1,590,565	213,540	201,200	64,609	13,802
'94	366,861	1,736,786	290,374	185,446	78,935	8,283
'95	374,109	1,856,506	322,114	212,148	94,848	5,116
'96	368,408	2,517,700	169,873	220,164	89,701	5,162
'97	412,857	1,827,042	161,290	216,378	111,743	5,437
'98	430,367	1,547,142	234,056	219,732	158,657	6,201

Note.—The imports of linseed and rape seed are shown in the text in weight; the rates of conversion adopted are 432 lbs. per quarter for linseed and 420 lbs. per quarter for rape seed. The imports of oil seed cake are the imports less the exports of foreign- and colonial-made cake; the exports of home-made cake were not distinguished prior to 1898, when they were valued at 85,000*l.*: this sum, at 5*l.* per ton of cake, would represent 17,000 tons. It has been therefore assumed that 17,000 tons would be about the average annual exports of cake of British produce, and allowance has been made for this quantity in the imports of linseed cake on p. 602.

TABLE IX.—*Conversion of Imports of Oil Seed Cake (including Imported Oil Seeds Converted into Cake) into Feeding Equivalent of Linseed.*

	Average Annual Net Imports of Oil Cake in form of Cake and Seed.	Rate of Conversion employed in Converting Cake into Linseed. (See Note.)	Feeding Equivalent in Bushels of Linseed at 54 lbs. per Bushel.
	cwts.		Bshls.
Linseed cake	6,807,000	6 units by weight of linseed cake are equivalent in feeding value to 5 units by weight of linseed	11,765,000
Cotton seed cake....	5,264,000	6·5 units by weight of decorticated, and 8 units of undecorticated cotton cake are equivalent in feeding value to 5 units by weight of linseed. Say, 7 units of cotton cake, decorticated and undecorticated = 5 units of linseed	7,799,000
Rape seed cake and other oil seed cake, as rape cake........	473,000	10 units by weight of rape cake are equivalent in feeding value to 5 units of linseed	490,000

Note.—The feeding equivalents given in this column are those adopted by Sir J. B. Lawes and Sir H. Gilbert in their article entitled "The Royal " Commission on Agricultural Depression, and the Valuation of Unexhausted " Manures," " Rothamsted Memoirs," vol. vii. See also " The Agricultural Note " Book."   Primrose McConnell, B.Sc., " Food Equivalents of 10 lbs. of Hay."

TABLE X.—*Estimates of the Area of Land of best Quality to Produce 1,200 lbs. of Beef, 112 lbs. of Mutton, or 500 Gallons of Milk.*

Estimate.	To produce 1,200 lbs. of Beef.	To produce 112 lbs. of Mutton.	To produce 500 Gallons of Milk.
	Acres.	Acres.	Acres.
No. 1	6·06	0·79	1·66
,, 2	7·0 to 7·5	0·58 to 0·60	2·50
,, 3	7·00	—	—
,, 4	5·98	—	2·37
,, 5	6·00	0·75	1·25
,, 6	6·00	—	—
,, 7	—	—	1·80
,, 8	6·00	0·47	—
,, 9	7·00	0·66	3·0
,, 10	—	—	2·0

DISCUSSION on MR. CRAWFORD'S PAPER.

SIR ROBERT GIFFEN said he had not come with the intention of speaking, but he must say a few words of praise to Mr. Crawford for the very excellent paper he had given. The method employed and the industry with which the materials had been worked out, had resulted in one of the most admirable papers the Society had had before it for some time. The questions discussed in the paper were obviously of the greatest interest, because they all liked to know what was the real dependence of this country on imported food, and how she stood as compared with her neighbours. After all they had heard about the imports of wheat, and the necessity of storing it so as to preserve the country against famine, it was very important to have a more complete account of the subject, showing that it was not merely wheat which had to be considered, and that our dependence on the imports of food was much greater than would be indicated by looking at the imports of wheat alone. In a complete survey it would be necessary to take into account not merely articles of agricultural production which competed with home agriculture, but also some articles which were produced abroad and which were not produced at home at all. Of them sugar, as mentioned by Mr. Crawford, was a conspicuous instance. Besides that there were various fruits and other products which had a very material feeding value. He did not know how far it would be proper to go beyond what might be strictly considered articles of food, and to include such things as tea, coffee, &c., which were to some extent necessary for the maintenance of life, health, and comfort in this country. The other lesson of the paper seemed to be that as well as ourselves other countries were concerned with this question, more particularly Germany, whose population was growing even faster than that of this country, and which clearly as time went on and that increase continued, must be more and more dependent on imports of food. France was saved from that necessity to some extent by the stationariness of her population, but Germany at least was practically in the same position as England, and as time went on she would have to look to imports of food and become dependent on supplies from abroad just as we were.

Dr. H. GERLICH thought that the paper supported the economic principles which he, in studying this subject, had tried to apply to the phenomena before him. John Stuart Mill once said the capital of the whole world was becoming one. In the same way, owing to modern methods of communication, the soil of the world was more and more becoming one. From an economic point of view the soil of the world ought not to be considered any longer as divided into the territories of the several States and nations, but as one international soil worked by international capital. The prairies of America, the grazing lands of Australia belonged to it, as did the farms of Essex or Northumberland. But the

English farmer was a very small capitalist in comparison with the enormous companies which sent out men and capital to cultivate the soils of the world beyond the seas. Still the same economic principles were applicable. He believed that the increase of population would bring inferior lands into cultivation by raising agricultural prices, and that the days of agricultural depression might be passed. Mr. Crawford had spoken of the immoderate protection afforded to agriculturists in Germany; but from what Dr. Gerlich had seen in the United States, where large capital was devoted to the cultivation of good land, and from the fact that the United States did not wish to allow free exchange of its agricultural produce with European manufactures, he felt that even more protection might be afforded to German agriculture in order to re-establish the equilibrium of international demand, disturbed by the protective tariff of the United States. Germany was more threatened than England by foreign competition because her soil was poorer.

Mr. SYDNEY YOUNG said they were especially indebted to Mr. Crawford for showing that the acreage of England was not sufficient to supply our food requirements. He should like to point out to the last speaker what protection cost France. A statement was lately made in the Chamber of Deputies that the total expenditure on bread for the population of $38\frac{1}{2}$ millions was equivalent to 96,000,000*l*. The cost of bread in France was generally from one-third to one-fourth greater than in England. Putting that down at the lowest figure, say one-fourth, if they took one-fourth of 96,000,000*l*., it showed that they still paid more than we do by 24,000,000*l*. annually, and that was the cost of their protection on food-stuffs alone. But the farmer had not benefited, as the cultivated acreage had not, since protection was introduced, been increased. The nation had not benefited, as the population was stagnant. In times of scarcity such as last year the French Government had to abrogate the duty on wheat so as to let in foreign wheat, and save the country from starvation; and so abundant is it this year under good crop conditions that it more than suffices for their wants, and the price had almost fallen to the free trade level, so that they are almost able to send wheat to England. Protection, therefore, had increased the difficulties of France in times of scarcity, and in times of plenty it tended to reduce the prices which the farmers obtained for their produce by over production.

Mr. R. H. HOOKER referred to the table on p. 621, which showed that we in England required less acreage to produce the cereals required to maintain a thousand of the population than the other countries dealt with in the paper; a table which also served in some degree as a measure of the production of cereals per acre. We were, however, sometimes reproached with not bringing more pasture land under the plough, and he had tried to find some indication whether we did not, nevertheless, utilise our land as well as our neighbours. He had accordingly worked out the

production of cereals per individual engaged in agriculture, and, as a result, found that each person so occupied in the United Kingdom produced quite as much cereals as a similar person in Belgium, France, or Germany; while, if England alone were considered, the production per individual was much greater; and this in spite of our devoting more than half our area to pasture, while the foreigner utilised barely one-fourth in this manner. In view of these facts he did not see why Belgium or any other country should be held up as an example to us.[1]

He wished further to emphasise a suggestion of the author's (p. 616) that the artificial support of protection might diminish the productive capacity of a country. This possible result of protection appeared to be often overlooked, and the theory seemed quite tenable that such a policy tended to remove the stimulus to greater exertion. Farmers in England had, for the last twenty years, had the stimulus of competition, which had caused them to work harder as prices fell. But the French and Germans, as prices went down, met the difficulty by raising the duties, and Mr. Crawford's remark prompted inquiry as to how far protection exercised a deterrent effect upon industry by enabling the people to continue to produce the same amount with no greater expenditure of labour than before.

Mr. R. Price-Williams said there was one aspect of this interesting question which did not appear to have occurred to either the author or any previous speaker. When he (Mr. Price-Williams) read a paper before the Society some years ago on the increase of population in England and Wales, he did not deal with its bearing on the food supply. However, Lord Armstrong wrote to him and at once fastened upon that, and at the close of his letter he said what a terrible calamity it would be, having regard to the fact that we were dependent on foreign production for our food, if we ever lost the control of the sea. Fortunately our rulers had recognised the importance of this matter, and he had no doubt that the far reaching influence of men like Lord Armstrong had had its effect. The gravity of the question had been greatly accentuated by what the author of this paper had submitted. Should our control of the sea ever be endangered, no one could see what terrible consequences might result. Even for the enormous population, within the seven-mile radius, of nearly six millions, the question presented itself, where were the food reserves of London? Some few years ago Dr. Smiles showed that within the compass of that seven miles there was not one week's supply of food. He thought that more provision should be made for storage, particularly of grain, within that distance. Not only foreign enemies but convulsions of nature might interrupt communications for periods which might reduce the supplies to a very alarming extent.

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[1] Mr. Hooker has developed this idea in a short article which will be found in the Miscellanea of the present number of the *Journal*.

Mr. GEORGE HOWELL did not think they were quite so short of supplies as the paper seemed to imply.   Some years ago a very able article by Admiral Maxse appeared in *Fortnightly Review* for August, 1870, dealing with the waste land of the United Kingdom. He (the speaker) followed this up by further inquiries published as a lecture in 1871, and subsequently expanded into a pamphlet in 1876.   From the facts then gathered he came to the conclusion that it would not be at all difficult to feed not only the whole of our present population but some 10, 15, or 20 millions more if there were need.   Of course it would be under very difficult conditions, perhaps too difficult, unless some steps were taken before the absolute need arose.   We had still some 10 million acres of land not under cultivation, a large proportion of which could be cultivated, and some of the best agricultural authorities had shown by example what could be done in that respect.   Of course a great deal of it would be too costly for the individual possessor or holder of land, and under such circumstances it would become necessary for the Government to do something. Take, for example, the enormous tract of land on either side of the Medway from Rochester to Sheerness; thousands of acres of good productive land could be reclaimed there and brought under cultivation.   In some respects, especially with regard to the reclamation of land, we were far behind the Hollanders and Chinese.   At the present moment there was only a possibility of such action being required.   But we had to consider the conditions under which we lived at present.   Our capital was mainly devoted to manufactures, the agricultural population was decreasing and coming more and more into the towns, and therefore we had to depend, naturally, more and more on foreign supplies for which our manufactures were exchanged.   The one great thing which operated against our increasing the food supply in the United Kingdom was the tenure of land.   This operated against its cultivation, and many complaints of the farmers would be removed if they could only go back to the old yeomanry system. Whether that was possible or not he did not know, but he hoped that the land tenure of this country would be put under altered conditions at no very distant future.   He agreed with the reader of the paper on the urgency of the question of the necessity of taking a broad view and striving to anticipate any difficulty should war arise and the ports be blockaded.   He was firmly convinced that if we saw the necessity for action, in two or three years' time the actual requisites mentioned in the paper could be produced to a very much larger extent than they were at present or had been for several years past.

Mr. R. H. REW said they were much indebted to Mr. Crawford for having demolished the popular fallacy, that under any conceivable economic conditions this country could feed itself.   He feared that like most popular fallacies it was immortal, and though crushed that evening it would rise again the next morning in undiminished vigour.   But however that might be, Mr. Crawford had at any rate furnished data for its refutation.   He declined

to discuss the question how far the tenure of land might have checked agricultural enterprise in this country. But he would venture to remark that, as the paper showed, we did not come out badly in comparison with other countries as regarded the productivity of our land, and therefore it seemed rather difficult to argue from the figures that the system of land tenure in this country had diminished the amount of food produced. He had expected and indeed hoped that some one would have taken up and challenged the estimate of milk production which he ventured to make in 1892 and to which attention was called in the paper. Mr. Crawford said, with truth, that that estimate had been challenged as being too low. But it must be remembered that the amount of the average production per cow was lowered by the inclusion of a large number of animals which provided only for the sustenance of their offspring and contributed nothing for human consumption. It was hardly necessary to point out that if one increased the divisor without increasing the dividend, the process of reducing the quotient was very rapid. But he thought that further inquiry at the present time might not obtain exactly the same results. He should not be surprised to find that the production of milk had increased since 1890, the year on which his calculations were based. In that belief he had already offered, if he could obtain sufficient assistance, to continue the inquiry made ten years ago, with the view of bringing the figures up to date. One remark applied to all these problems of food production and consumption: it was easy to get a very plausible figure if one only looked at one side of the question. If his inquiry on milk had any merit it was that he endeavoured to attack the question from both sides, first, to obtain data from those who produced the milk, and next other data from those who consumed it. The difficulty of the undertaking arose in endeavouring to balance the account of the figures of production with those of consumption.

Mr. Crawford had pointed out that in Belgium they had for fifteen years cheerfully reckoned their wheat acreage as about 200,000 acres more than it really was. He could understand, though he would view with horror, the position of a country which declined to collect agricultural statistics, holding them to be unnecessary, but he could not understand the position of a country which considered them necessary, but did not collect them annually. The danger of a half-hearted system was abundantly exemplified by this shocking example of Belgium.

Mr. G. B. DOBSON said that Sir Robert Giffen had referred to tea and coffee as matters which should be included in an examination of the food supply, but there were other articles used as part of the food supply by various countries. For instance, in France, oil, eggs, and especially wine, were largely used in place of meat. In France, and Belgium too, a considerable amount of chicory was produced for use instead of coffee. Other things affected the comparative weight of meat eaten in various countries. For in Germany, except in the north at Lubeck and Hamburg, &c.,

very little fish was eaten indeed; only Rhine salmon and fresh-water fish, such as carp, were obtained there.   In England, on the contrary, we ate a very great deal of fish.   France probably stood midway between the two.   This point must be given due weight in making a comparison of the food consumed by different countries.

Dr. Gerlich said that in Germany, near the Baltic, the people were very great fish eaters.

Mr. N. L. Cohen, in view of the somewhat pessimistic anti-cipations and references of some of the speakers, ventured to call attention to one source of possible economy in food supplies in case of actual emergency, namely, a reduction in the amount of food habitually taken, especially by the wealthy and well-to-do classes in the country.   In the greater part of the continent the vast majority of the people were content with two substantial meals a day, instead of three such meals taken mostly in England. He believed that if an emergency arose there would certainly be a spontaneous disposition amongst many to adopt the simple expedient of reducing their habitual rations, and eating less, with perhaps, in many cases, very small practical inconvenience.   He should have liked to have seen the statistics so ably presented by Mr. Crawford still further subdivided, so as to show the variations in different periods of the year of the dependence of the country on imports for its food supply.   They knew roughly the variations arising from the annual marketing of their own harvest and the periods thereby affected.   But he thought it would be a matter of great interest if they could measure statistically the extent of the greatest periodical depletion of the available food supply, and the periods affected in reference to the marketing of the leading foreign harvests, especially from very distant countries.   Another point worth mentioning was the effect of the modern facilities for the preservation of nutritious products.   Perhaps sufficient allowance was not made in the statistics presented for the accumulation of storage from previous years.   He thought there might be a much larger resource than was commonly supposed in foods preserved in various ways and forms.   In an emergency there would also be generally a certain self-control and self-abnegation, which he thought would lessen the strain in any temporary difficulty in regard to the food supply.

The Chairman (Major P. G. Craigie), in moving a vote of thanks to Mr. Crawford, said he did not think it was incumbent on a chairman at their meetings to lay down in any elaborate way his own views.   The paper submitted to the Society that day by one who had studied closely the various sources of the figures he brought forward, afforded a good example of the proper sphere of the Society's functions.   It was their duty to test and check the basis of the conclusions arrived at, and to note points arising out of the papers which afforded suggestive lines for future discussion.   The Royal Statistical Society were no purely specu-

lative or theoretical body holding certain strong economic or
political opinions of one kind or another, and in search of a
sufficient array of passable figures to support their belief. They
rather proceeded in the opposite direction by encouraging the
submission of papers by writers who strove to pick out from
every available source all the possible factors which bore on the
issue before them, to bring these compendiously together, and
thus from various and often differing lines of data to bring out
a sound general conclusion. Mr. Crawford, in following this
method, therefore, was fully entitled to the very best thanks of
the Fellows of the Society then present, and he would earn the
gratitude of a still wider body when the paper came to be printed
and studied in detail. If there was any subject on which it was
most important that they should avoid preconceived theories and
think seriously and with rigid exactitude, it was this question of
the food supply of a great and an ever growing country like their
own. The food supply of any country was, however, no longer to
be regarded simply as the wheat supply. Too much of their
energies as statisticians had perhaps in the past been directed to
that primary and staple grain. Even if they enlarged the scope
of their survey of breadstuffs to include cereals of equal or greater
importance in many regions, such as rye or maize, they were far
from exhausting the constituents of a perfect food supply. Mr.
Crawford was therefore wisely taking a wider survey than he had
done on a previous occasion when he had addressed the Society.
Some of them might have liked, if possible, to have seen some
further additions to the articles referred to by the paper. One
useful result of that meeting might be to direct more attention
than had yet been given to two of the most doubtful items in
the estimates submitted, namely, the estimated production of
meat and of milk in different countries. There was room here
for some divergences of opinion, and, as somewhat different
estimates had been advanced in some quarters, it was almost
a pity that the author had not elicited more criticism which
they all welcomed in that Society. It was very important, in
dealing with the question of international comparison, to bear
in mind the difficulty of quite fairly measuring one country's
products against another. There was to be remembered the
totally different character of the agriculture, the different stamp of
populations, and the varying demands for consumption. To take
one instance, that of relative consumption of meat. He under-
stood from the paper that it was in the consumption of beef and
of mutton in which John Bull held undoubted pre-eminence. The
inhabitants of the United Kingdom demanded something like
63 lbs. of beef per head per annum, whilst France and Germany
were content with 43 lbs., and Belgium with 40 lbs. Passing to
the item of mutton, he found there was still greater divergence
than perhaps in any other article. For every pound of mutton
that Belgium consumed, we appear to have consumed about sixteen.
The English consumption was something like 32 lbs., of which
two-thirds was still produced at home, but Germany required only
some 3½ lbs. Even when compared with France, where 10 lbs. of

mutton per annum was required per person, our consumption was still more than three to one. This variation of demand might explain the extremely different density of stock in the various countries. On 1,000 acres of land in this country we still maintained, in spite of some diminution, something like 400 sheep; in France they had only about 164; in Germany about 81, and in Belgium only about 32. It was obvious, in spite of all the expansion of sheep farming in the lightly peopled and younger districts of Australasia and in the Argentine, that one point which distinguished England over all others was the extent of the valuable flocks she still maintained. The question whether our own or any country could feed itself must after all be determined by the great factor—the cost of production—which, as the writer of the paper showed, imposed a limit much below the theoretical possibilities often credited to the soil. Wherever the density of the population became great, in Belgium no less than here, resort was inevitable to foreign sources of supply, as was most fully brought out in this paper. He suggested to Mr. Crawford as a subject for further research the actual extent of the consumption of vegetable products by horses, and its bearing on this subject. The late Mr. Jenkins had shown in a paper read before the London Farmers' Club five and twenty years ago, what an enormous proportion it was. One horse consumed, so he suggested, about as much as eight men, and this must have considerable bearing on the question of food supply. He agreed with Mr. Rew that the two questions of meat production and milk production were subjects on which the older figures were, in view of recent developments, very uncertain. He thought it might well become the Society to consider whether they could not appoint a special committee, as was sometimes done in the old days, to form some definite conclusion on this somewhat occult and controversial subject. In conclusion, he asked them cordially to thank Mr. Crawford for his most interesting paper.

The vote of thanks was put from the Chair and unanimously accorded.

Mr. R. F. CRAWFORD, in reply, said that with regard to the inclusion of other foods the great difficulty was to know where to stop. The subject was so large that he could not deal exhaustively with it. Jam, tea, beer, fish, rabbits—all these things were certainly food products, but he had thought it better to confine himself to the four fundamental articles—bread, meat, milk, and potatoes. With regard to what Dr. Gerlich had said, he did not propose to go into the question of free trade or protection, but he rather agreed with him that perhaps in the future one of the possibilities would be that much of the land which had been abandoned to grass would again come under the plough. He imagined that the change would begin through the gradual increase in the cost of production in the Western States of America, where they would have to begin to fertilise the soil and to employ more labour to get the same result. That would bring the cost of production nearer the level of the cost in the Eastern States. The process would go on until it became possible to bring under the plough land in this

country which could not compete at present with the land in those
countries.   But, as he had already said, the amount of land which
could be again brought under the plough in this way would not
suffice to enable us to produce a sufficient quantity of wheat for
ourselves without displacing other products.   That brought him
to Mr. Howell's point, and he was not prepared to admit the
contention that anything like 10,000,000 acres of land lay unpro-
ductive and could be brought under cultivation.   But even if there
were, it was not 50 per cent. of the 23,000,000 acres they would
require under the very moderate estimate he had assumed.   He
had pointed out that to get this acreage of land required it would
need the cultivation of the entire area of land in the United
Kingdom.   He concluded by citing two passages from articles by
Sir John Bennett Lawes and Sir Henry Gilbert, in which they
dealt with the question of changes in the system of cultivation
and of land tenure in this country.   These extracts showed that in
the opinion of those authorities no alteration in these matters
would enable England to become a self-supporting country in the
sense of producing the food her people require.

Some STATISTICS *relating to* WORKING CLASS PROGRESS *since* 1860.
By GEORGE H. WOOD.

MY object in the following paper is to offer for consideration certain statistics relating to working class progress which are not usually given the prominence they deserve in such discussions. I propose to trace not only the variations in wages, but also those of want of employment and the consumption of certain commodities, and with the aid of a diagram showing these and other movements, to try to arrive at some conclusions respecting the movements of the standard of living and their causes. Instead of merely endeavouring to estimate the progress of the working classes over the period 1860-96, I propose to examine the indications of progress in periods, and their fluctuations over short periods. Indeed, it is to these fluctuations more than the general tendencies that I propose to direct attention, and my method will be where possible to arrange the data in the form of index-numbers.

The three chief features to which I wish to call your attention are wages, unemployment, and the consumption of commodities. Mr. Bowley has already measured the height of money wages in certain years since 1860, but as this measurement was insufficient for my present purpose, I placed before him the questions, in what years were there fluctuations in money wages; when were the maxima and minima respectively; and what have been the movements since 1891? These questions can only be definitely answered when he has completed his scheme of an index-number throughout the century, of which he publishes portions quarterly in the Society's *Journal*. But on the basis of the evidence given in the appendix, he has interpolated tentative results as follows:—

TABLE I.—*Variations in Average Money Wages,* 1860-96.

1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.
72	72	72	73	74	77	81	82	79	79	81	84

1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.
94	103	99	97	96	95	92	89	89	90	92	93

1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891	1892.	1893.	1894	1895.	1896.
92	91	90	91	91	95	100	101	101	102	101	101	100

The Course of Want of Employment.

As the above index-number represents only changes in a normal week's earnings and does not take into account want of employment, I have thought it useful to attempt an estimate, from such material as exists in convenient form, of the changes in direction of the quantity of employment offering itself, and, by a more detailed analysis of portions of the material, to measure the actual amount of unemployment annually. If we wish to arrive at the definite money earnings of the wage-earners represented in our wages calculations, we must subtract from the nominal money wage the percentage lost through enforced idleness arising out of the depressed state of trade. Also, although unfortunately no material exists for such work, we should add the percentage earned by overtime work in times of good trade. It is to the former I am now directing attention, and the evidence for thirty-two years is taken from the Fourth and Fifth Reports on Trade Unions. Since 1886 the Labour Department has monthly collected statistics relating to want of employment among trade unionists, and it has been my endeavour to arrive at an estimate comparable with the annual averages of these official monthly accounts, so that the general changes may be traced for thirty-six years.

TABLE II.—*Showing the Average Percentage of Members of certain Trade Unions in Want of Employment*, 1860-91.

	1860.	1861.	1862.	1863.	1864	1865.	1866.	1867.	1868.	1869.	1870.
Amalgamated Society of Engineers	1·2	3·2	6·5	5·4	2·3	1·8	2·4	6·6	8·3	7·8	4·2
Friendly Society of Iron-founders	2·8	8·6	13·8	9·3	4·5	3·6	6·4	15·9	18·0	15·5	6·9
Warehousemen's Philanthropic	1·0	1·5	1·3	0·7	1·2	1·0	0·8	1·3	0·9	0·6	1·0
London Operative Zinc Workers	0·41	1·75	1·41	1·8	0·50	0·25	2·92	2·0	0·25	2·66	1·0
Associated Blacksmiths	4·9	0·87	1·5	0·6	0·3	0·7	6·5	3·2	2·7	1·2	1·2
London Society Compositors	0·97	1·37	1·4	1·4	2·15	2·82	2·75	3·12	3·3	3·82	4·72
United Carpenters and Joiners	—	—	—	1·6	0·24	0·25	0·62	2·6	2·6	4·0	4·5
Leith and Edinburgh Coopers	—	—	—	1·05	2·8	—	—	—	—	—	—
Steam Engine Makers	—	—	—	—	—	0·8	1·1	3·2	5·7	5·4	2·2
Glass Bottle Makers, Yorkshire	—	—	—	—	—	—	—	6·06	3·6	1·5	3·15
Bradford Overlookers	—	—	—	—	—	—	—	—	0·75	0·78	0·95
Amalgamated Tailors	—	—	—	—	—	—	—	—	—	0·62	0·35
Number of unions giving percentage	6	6	6	8	8	8	8	9	10	11	11
Average unemployed	1·88	2·88	4·33	2·73	1·76	1·38	2·93	4·89	4·61	3·99	2·73

TABLE II *Contd.—Showing the Average Percentage of Members of certain Trade Unions in Want of Employment,* 1860-91.

	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Amalgamated Society of Engineers	1·3	0·9	1·1	1·6	2·4	3·6	4·7	6·8	13·3	5·9	3·5
Friendly Society of Ironfounders	2·4	1·4	3·2	3·9	3·5	5·7	9·1	14·6	22·3	10·9	7·8
Warehousemen's Philanthropic	0·5	0·7	0·7	0·7	0·9	1·9	2·1	2·0	2·6	2·3	2·1
London Operative Zinc Workers	0·83	1·0	1·17	0·33	0·41	1·17	0·83	0·16	1·0	1·34	0·91
Associated Blacksmiths	0·56	0·92	0·35	0·94	1·4	2·0	2·0	4·4	11·1	2·7	1·2
London Society Compositors	2·82	2·07	1·7	1·85	1·42	2·12	2·65	2·77	3·57	3·27	3·15
United Carpenters and Joiners	3·5	1·3	1·0	0·87	0·82	0·87	1·1	2·5	7·6	6·3	4·9
Leith and Edinburgh Coopers	—	—	—	—	2·3	—	—	—	0·6	0·6	1·56
Steam Engine Makers	0·58	0·53	0·65	0·81	1·2	2·0	2·7	4·7	10·1	3·5	2·1
Glass Bottle Makers, Yorkshire	1·93	0·73	0·49	0·85	1·16	2·63	6·1	7·3	13·4	11·4	5·16
Bradford Overlookers	0·77	0·67	1·75	1·11	0·87	0·81	0·92	1·56	1·36	0·81	0·9
Amalgamated Tailors	0·35	0·45	0·45	0·43	0·55	0·55	0·48	0·46	0·46	0·43	0·45
Boiler Makers and Iron Ship Builders	—	—	1·1	2·4	5·8	8·6	7·7	9·2	20·4	7·3	1·7
Kilkenny Operative Bakers	—	—	—	3·7	3·9	8·0	8·0	12·2	8·5	12·0	8·0
Iron, Steel, and Tin Workers	—	—	—	—	—	1·3	1·6	1·3	1·7	0·5	0·6
Amalgamated Association of Pressmen	—	—	—	—	—	1·8	2·7	2·3	3·2	2·4	2·4
London Saddle and Harness Makers	—	—	—	—	—	1·6	0·27	—	0·28	0·6	1·1
Silk Dressers	—	—	—	—	—	4·4	4·7	5·5	2·3	2·6	1·8
Amalgamated Engine Drivers and Stokers	—	—	—	—	—	1·81	2·62	2·5	2·64	1·43	1·10
Leeds Tanners	—	—	—	—	—	1·62	1·85	2·67	2·08	1·05	1·34
Pattern Card Makers	—	—	—	—	—	1·72	1·42	—	1·08	1·4	1·17
Bradford Stuff Makers-up	—	—	—	—	—	1·41	1·54	1·68	1·88	1·84	1·7
Amalgamated Tin Plate Workers	—	—	—	—	—	—	0·73	0·90	1·25	1·38	0·9
United Brush Makers	—	—	—	—	—	—	—	8·4	14·0	10·8	6·2
Stove Grate ,,	—	—	—	—	—	—	—	1·46	2·0	1·28	2·45
West Yorks. Colliery Enginemen	—	—	—	—	—	—	—	—	2·25	1·0	0·8
Printers' and Transferers' Society	—	—	—	—	—	—	—	—	0·52	0·5	0·8
Belfast Power Loom Yarn Dressers	—	—	—	—	—	—	—	—	1·31	2·87	—
Bradford Dyers, &c.	—	—	—	—	—	—	—	—	—	0·8	0·6
London Litho. Machine Minders	—	—	—	—	—	—	—	—	—	2·61	1·97
Vellum Account Book Binders	—	—	—	—	—	—	—	—	—	1·3	1·15
Number of unions giving percentage	11	11	12	13	14	21	22	22	21	31	31
Average unemployed	1·41	0·97	1·14	1·5	1·9	2·65	2·99	4·33	5·45	3·32	2·24

TABLE II_*Contd.—Showing the Average Percentage of Members of certain Trade Unions in Want of Employment*, 1860-91.

	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.
Amalgamated Society of Engineers	1·8	2·3	5·1	6·2	7·4	6·3	4·2	1·9	1·6	3·1
Friendly Society of Iron-founders	4·3	4·3	7·2	10·9	13·9	10·0	5·6	1·8	2·4	4·6
Warehousemen's Philanthropic	2·0	2·0	2·0	1·6	1·4	1·5	2·7	1·5	1·3	—
London Operative Zinc Workers	1·83	1·66	2·58	7·35	9·0	10·66	11·75	1·25	1·25	2·28
Associated Blacksmiths	0·67	1·0	9·2	15·9	14·4	12·7	5·0	2·7	2·5	1·88
London Society Compositors	2·85	2·72	2·65	3·02	2·8	2·62	2·82	2·5	2·2	1·88
United Carpenters and Joiners	3·0	3·2	4·0	6·1	7·8	5·8	5·5	3·9	1·9	2·25
Leith and Edinburgh Coopers	1·94	0·45	0·8	0·89	1·32	1·7	1·9	—	1·5	2·3
Steam Engine Makers	1·1	1·4	2·6	4·4	5·8	5·8	2·6	0·93	0·67	1·14
Glass Bottle Makers, Yorkshire	7·3	4·23	6·26	5·3	7·5	6·2	5·14	4·37	2·9	—
Bradford Overlookers	0·87	0·77	0·67	0·87	0·78	0·90	0 66	0·48	0·43	0·56
Amalgamated Tailors	0·37	0·35	0·39	0·37	0·30	0·36	0·39	0·27	0·23	0·20
Boiler Makers and Iron Ship Builders	0·65	1·2	20·0	22·3	22·2	16·2	7·8	2·2	3·3	5·6
Kilkenny Operative Bakers	10·8	8·6	6·9	9·3	15·4	17·0	14·0	15·5	—	—
Iron, Steel, and Tin Workers	0·3	0·3	2·7	4·4	2·9	11·5	—	3·1	—	—
Amalgamated Association of Pressmen	2·7	3·1	2·3	2·4	2·3	2·2	2·17	2·4	1·2	1·47
London Saddle and Harness Makers	1·3	2·3	2·8	2·6	3·0	2·5	1·9	1·3	0·94	0·56
Silk Dressers	3·7	2·8	2·0	3·8	2·0	2·7	2·7	3·4	7·1	0·47
Amalgamated Engine Drivers and Stokers	2·98	1·96	1·87	2·54	2·08	2·15	2·15	1·3	1·25	1·86
Leeds Tanners	1·95	1·56	1·98	1·86	1·11	1·41	1·80	1·21	1·0	1·16
Pattern Card Makers	1·24	1·84	1·79	1·41	1·41	1·31	1·26	1·51	1·44	1·1
Bradford Stuff Makers-up	1·67	1·89	1·38	1·33	1·09	0·3	0·51	0·75	1·08	1·3
Amalgamated Tin Plate Workers	1·05	1·05	1·05	0·95	1·20	1·27	1·27	0·72	—	0·6
United Brush Makers	4·7	5·3	4·9	6·6	6·6	7·4	4·7	4·7	3·3	4·4
Stove Grate „	1·32	1·54	2·87	3·37	3·87	4·35	—	—	—	—
West Yorks. Colliery Enginemen	1·2	0·7	0·85	2·06	0·66	0·51	0·98	0·6	0·66	0·18
Printers' and Transferers' Society	0·41	0·41	0·57	0·25	0·41	0·27	0·50	1·05	2·1	1·08
Belfast Power Loom Yarn Dressers	1·34	2·9	2·81	2·89	3·09	1·91	0·93	0·86	2·12	1·5
Bradford Dyers, &c.	0·5	0·58	0·52	1·2	0·71	1·0	0·6	0·54	1·0	0·49
London Litho. Machine Minders	2·52	2·11	2·37	2·36	2·62	2·49	1·89	2·09	2·25	2·2
Vellum Account Book Binders	1·3	1·27	1·5	1·55	1·15	0·75	0·75	0·57	0·52	0·7
Number of unions giving percentage	31	31	31	31	31	31	29	29	27	26
Average unemployed	2·25	2·12	3·38	4·39	4·72	4·57	3·25	2·25	1·78	1·72

This table gives the comparative percentages contained in the Fifth Report on Trade Unions, and it was only after a detailed examination of these percentages that I discovered that results obtained from them tended systematically to understate the evil. It is valuable as showing that in the case of a trade depression all, or nearly all, trades tend to be affected in the same manner, and that the general average shows similar fluctuations whether the number of workers represented be large or small. But the deadening effects of severe depressions are minimised; first, because a good many trades included in it generally suffer through working short time and not total unemployment, and no account is taken of this species of "playing;" second, because the averages are worked out from the trade union returns on the assumption that the total yearly number returned as unemployed, divided by twelve, yields the monthly average for the year. To cite an instance, the Bradford Stuff Makers report the following:—

Year.	Members.	Unemployed.		Given in Fifth Report on Trade Unions.
		Total Number.	Percentage.	
1876	159	27	16·98	1·41
'77	162	30	18·51	1·54
'78	163	33	20·24	1·68
'79	173	39	22·54	1·88
1880	172	38	22·09	1·84
'81	176	36	20·45	1·7
'82	169	34	20·11	1·67
'83	167	38	22·75	1·89
'84	169	28	16·56	1·38
'85	170	34	20·00	1·33
'86	168	22	13·09	1·09
'87	165	6	3·63	0·3
'88	161	10	6·21	0·51
'89	165	15	9·09	0·75
1890	161	21	13·04	1·08

Here the average in the 5th column is arrived at in the manner indicated, and shows, except in the last five years, little fluctuation. But no allowance is made for the varying periods of time individual members may be out of work, and the assumption underlying the method is that each member unemployed is so for a period of one month, and that this is so in each year. The actual truth is that only when the total number of days lost in each year is known, can we form any adequate idea of the variations of employment from returns made up on this plan. An extreme hypothetical case will illustrate this clearly.

Suppose there are one hundred members, and ninety are returned as the number unemployed. Here the percentage is 90, and the average over the year, if divided by twelve, is 7·5. But if the 90 have only been unemployed one week, the total lost time is 90 weeks, and assuming 50 weeks in the year, the maximum possible time to be worked is 5,000 weeks, which denotes 1·8 per cent. as the average unemployment. Similarly, if ten are returned as the total unemployed, the percentage is 0·8, whereas these ten members might possibly be unemployed throughout the year, and the real percentage is 10 for the whole year. In busy times, especially in certain trades, there may be a large percentage of members who at some time or other during the year have been on the books, yet the average time lost per member throughout the year may be small. In slack times in other trades, or even branches of the same trade, a number of members who are " preference " hands may be kept employed, or, by partial employment, have their places assured them, while a smaller number may be out of employment all the year round, and the actual percentage of unemployment, meaning time lost, will be large. If, however, the returns are made as suggested above, the course of employment or want of it will be shown, and the general comparative state of trade clearly indicated. But these figures cannot be used with those obtained monthly (as of the Amalgamated Society of Engineers, &c.), or with those which give the monthly average percentage, and therefore are representative of the same quantity as those published in the " Labour Gazette."

For these reasons I have prepared the following table,[1] which shows the total number of members at the end of the year, and the average monthly percentage of this total who were unemployed :—

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[1] From the Fourth Report on Trade Unions.

Table III.—*Showing the Number of Members of certain Trade Unions in each Year, with the Percentage of the Total Unemployed.*

Trade Unions.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.
Amalgamated Engineers	20,935	22,862	24,234	26,058	28,815	30,984	33,007	33,325
United Brushmakers	—	—	—	—	—	—	—	—
Amalgamated Carpenters and Joiners	—	—	—	1,718	3,279	5,670	8,062	8,022
Amalgamated Tailors............	—	—	—	—	—	—	—	—
United Boilermakers	—	—	—	—	—	—	—	—
Steam Engine Makers	—	—	—	—	—	2,521	2,712	2,843
Friendly Ironfounders	7,973	8,229	8,458	8,840	9,723	10,604	11,121	10,839
Yorks. Glass Bottle Makers	—	—	—	—	—	—	—	692
National Amalgamated Iron, Steel, Tin, and Blast Furnace Workers	—	—	—	—	—	—	—	—
London Compositors	2,650	2,550	2,170	2,555	2,600	2,800	3,335	3,290
Associated Shipwrights	—	—	—	—	—	—	—	—
„ Blacksmiths	856	1,040	1,142	1,196	1,598	1,815	2,214	2,034
United Patternmakers	—	—	—	—	—	—	—	—
Scottish Typographical Assoc.	—	—	—	—	—	—	—	—
Amalgamated Steel Smelters*	—	—	—	—	—	—	—	—
Total............................	32,414	34,681	36,004	40,367	46,015	54,394	60,451	61,045
Average per cent. unemployed throughout the year	1·61	4·28	7·81	5·74	2·56	2·01	3·10	7·34
Average of previous ten years†	—	2·94	4·56	4·86	4·40	4·00	3·87	4·30

Trade Unions.	1868.	1869.	1870.	1871.	1872.	1873.	1874.	1875.
Amalgamated Engineers	33,474	33,539	34,711	37,790	41,075	42,382	43,150	44,032
United Brushmakers	—	—	—	—	—	—	—	—
Amalgamated Carpenters and Joiners	8,736	9,305	10,178	9,764	11,236	12,789	13,817	14,917
Amalgamated Tailors	—	3,994	4,006	4,914	9,061	12,383	13,862	14,352
United Boilermakers	—	—	—	—	—	13,137	14,715	16,191
Steam Engine Makers	2,873	2,805	2,819	3,063	3,392	3,527	3,701	3,871
Friendly Ironfounders	9,853	8,990	8,994	10,019	10,634	11,512	11,925	12,336
Yorks. Glass Bottle Makers	720	759	792	878	954	1,018	1,058	1,120
National Amalgamated Iron, Steel, Tin, and Blast Furnace Workers	—	—	—	—	—	—	—	—
London Compositors	3,320	3,300	3,350	3,500	3,706	3,700	3,800	4,200
Associated Shipwrights	—	—	—	—	—	—	—	—
„ Blacksmiths	1,532	1,509	1,590	1,613	1,731	1,964	2,014	2,113
United Patternmakers	—	—	—	—	—	—	—	—
Scottish Typographical Assoc.	—	—	—	—	—	—	—	—
Amalgamated Steel Smelters*	—	—	—	—	—	—	—	—
Total............................	60,508	64,201	66,440	71,541	81,783	102,412	108,042	113,132
Average per cent. unemployed throughout the year	8·51	7·42	4·32	1·81	1·06	1·26	1·76	2·49
Average of previous ten years†	4·77	5·04	5·31	5·06	4·39	3·94	3·86	3·80

* Kindred to the National Amalgamated Iron, Steel, Tin, and Blast Furnace Workers, who drop out.
† Until 1869 the average is that of all the previous years shown in the table.

TABLE III—*Contd.—Showing the Number of Members of certain Trade Unions in each Year, with the Percentage of the Total Unemployed.*

Trade Unions.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.
Amalgamated Engineers	44,578	45,071	45,408	44,078	44,692	46,101	48,388	50,418
United Brushmakers	—	—	1,828	1,765	1,583	1,544	1,566	1,551
Amalgamated Carpenters and Joiners	16,038	16,829	16,574	17,034	17,764	18,765	20,622	22,839
Amalgamated Tailors.............	14,738	14,408	13,888	12,375	12,583	12,593	13,304	14,203
United Boilermakers	17,469	19,660	18,584	16,988	17,688	20,676	27,408	28,477
Steam Engine Makers	3,938	4,124	4,247	4,071	4,134	4,387	4,591	4,762
Friendly Ironfounders	12,627	12,612	12,620	12,276	11,350	11,201	11,448	11,917
Yorks. Glass Bottle Makers	1,137	1,150	1,149	1,149	1,061	1,045	1,025	1,227
National Amalgamated Iron, Steel, Tin, and Blast Furnace Workers	4,054	2,563	1,826	1,433	1,688	1,624	2,600	2,350
London Compositors	4,445	4,480	4,700	4,930	5,100	5,300	5,660	5,850
Associated Shipwrights	—	—	—	—	—	—	—	—
„ Blacksmiths	2,194	2,295	2,258	2,118	2,002	2,088	2,363	2,757
United Patternmakers	—	—	—	—	—	1,022	1,218	1,260
Scottish Typographical Assoc.	—	—	—	—	—	—	1,684	1,819
Amalgamated Steel Smelters*	—	—	—	—	—	—	—	—
Total............................	121,218	123,192	123,082	118,217	119,875	126,346	141,877	149,430
Average per cent. unemployed throughout the year	3·56	4·44	6·31	12·5	5·93	3·45	1·92	2·23
Average of previous ten years	3·95	3·66	3·44	3·95	4·11	4·17	4·36	4·46

Trade Unions.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.
Amalgamated Engineers.......	50,681	51,689	52,019	51,869	53,740	60,728	67,928	71,221
United Brushmakers	1,467	1,502	1,511	1,486	1,416	1,356	—	1,521
Amalgamated Carpenters and Joiners	24,784	25,781	24,979	25,497	25,050	26,472	31,495	34,779
Amalgamated Tailors..	13,661	13,969	13,724	14,305	14,214	15,276	16,629	17,573
United Boilermakers	28,730	28,212	26,776	25,100	26,545	29,993	32,926	36,996
Steam Engine Makers	4,910	5,062	5,079	5,080	5,165	5,500	5,822	5,965
Friendly Ironfounders	12,415	12,376	12,037	11,718	·12,202	13,805	14,821	15,291
Yorks. Glass Bottle Makers	1,421	1,522	1,554	1,484	1,536	1,717	1,899	—
National Amalgamated Iron, Steel, Tin, and Blast Furnace Workers	1,121	1,050	1,030	1,220	—	771	—	—
London Compositors	6,175	6,435	6,585	7,025	7,400	7,955	8,910	9,350
Associated Shipwrights	—	—	3,476	3,578	4,389	5,540	7,389	10,120
„ Blacksmiths	2,653	2,335	2,091	1,628	1,628	2,077	2,300	2,319
United Patternmakers	1,217	1,241	1,279	1,334	1,629	1,968	2,205	2,314
Scottish Typographical Assoc.	1,898	1,995	2,121	2,238	2,437	2,620	2,622	2,784
Amalgamated Steel Smelters*	—	—	—	—	—	—	—	2,917
Total............................	151,133	152,169	154,261	153,562	157,351	175,778	194,946	213,150
Average per cent. unemployed throughout the year	7·40	8·98	9·55	7·42	4·55	2·05	1·90	3·04
Average of previous ten years	5·00	5·66	6·27	6·57	6·39	5·35	4·94	4·90

* Kindred to the National Amalgamated Iron, Steel, Tin, and Blast Furnace Workers, who drop out.

The trade unions here mentioned represent eight industries, viz., manufactured iron, unmanufactured iron, printing, brush-making, wood shipbuilding, building, glass bottle making and clothing, although the representation of building is not adequate. In the earlier table other industries are also represented, and for this reason it is to be regretted that the percentages are not of more use.

The best test we can have of the reliability of this table as indicating the level of employment, is by comparison with the Labour Department's returns.

TABLE IV.—*Average Unemployment of Trade Unionists.*

	Percentage indicated by Table.	Percentage of Monthly Labour Department Reports.
1887.....................	7·42	8·16
'88.....................	4·55	4·83
'89.....................	2·05	2·10
1890.....................	1·90	2·12
'91.....................	3·04	3·5
'92.....................	—	6·25
'93.....................	—	7·5
'94.....................	—	6·91
'95.....................	—	6·66
'96.....................	—	3·41

The greatest difference here is that of 1887, where the official figures indicate a larger amount of want of employment by 0·74 per cent. This difference can scarcely be important, but it is significant that in each case the percentage I have arrived at is less than the official percentage. This being so, we may feel tolerably certain that in Table III we keep well within the amount of the evil, and it is possible that we actually understate it throughout.

Although the total number of trade union members in the table is so small relatively to the number of members of all trade unions, we get fairly consistent conclusions from either method in answer to the question, "Has the burden of the unemployed "become lightened or intensified since 1860?" The quinquennial and decennial averages of each table indicate much the same state of change. They are (*a*) from Table II :—

1860–64.	1865–69.	1860–69.	1870–74.	1875–79.	1870–79.	1880–84.	1885–89.	1880–89.
2·71	3·56	3·14	1·55	3·46	2·50	2·46	3·83	3·25

(b) from Table III :—

1860–64.	1865–69.	1860–69.	1870–74.	1875–79.	1870–79.	1880–84.	1885–89.	1880–89.
4·40	5·67	5·04	2·04	5·79	3·91	4·18	6·52	5·34

From 1890-96 the Labour Department averages indicate a greater percentage than either of the above, viz., 6·04, but we cannot safely compare it with them, because it covers a much larger body of workers, and the period to which it relates is too short. The conclusion which may be drawn from these figures seems to be, that the percentage unemployed was largest in 1880-89, but not much above 1860-69, and that the numbers are lowest for 1870-79, in the early half of which unemployment reached its minimum.

These conclusions are not at variance with the following analysis of individual union returns :—

Percentage of Unemployed Members of Trade Unions.   Decade Averages.

	Amalgamated Engineers.	Percentage Friendly Iron-founders.	London Compositors.	Associated Black-smiths.	Ware-house-men.	Zinc-workers.	Carpenters and Joiners.	Steam Engine Makers.	Glass Bottle Makers.	Average of these Unions.
1860–69	4·58	9·84	3·08	2·24	1·03	1·39	1·7	3·24	3·72	3·21
'70–79	3·76	7·36	3·43	2·49	1·31	0·79	1·95	2·54	3·77	3·04
'80–89	4·46	8·67	3·75	6·56	1·91	4·84	5·05	3·02	6·28	4·95

In fact, no series of averages I have been able to calculate have failed to show similar results. If we take the decade averages year by year, thus eliminating individual fluctuations, the same tendency towards a greater percentage of unemployment presents itself.[2]   But as it is not the chief aim of this paper to discuss this problem, but only to follow if possible the general effects of trade depressions on the wage earners, I think sufficient has been said to justify the conclusion that the averages arrived at in Table III indicate, within a sufficient degree of accuracy, the general level and tendency of the labour market at any given period, and afford sufficient evidence for the line of unemployment on the diagram.

Consumption of Commodities.

Although we are able to measure money wages with tolerable certainty, we are not as yet able to measure real wages within any definable limit of error. Wholesale price index-numbers afford little reliable evidence of the variations of retail prices, but the compilation of an index-number of retail prices is a task of

[2] *Cf.* Table III.

difficulty. I regret that, although I have been collecting data for three or four years with this end in view, I have not yet acquired enough to produce a sufficiently reliable result. But if we are unable, from want of material, to measure purchasing power, we have material for the measurement of changes in the consumption of commodities. In the "Statistical Abstracts" are published statistics showing the amounts per head of imported goods retained for home consumption. These with others are given in the following table :—

TABLE V.—*Showing Quantities of Goods Consumed per Head*, 1860-96.

		1860.	1862.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.
Corn—wheat and wheat-flour	bshls.	4·602	5·568	6·472	5·570	5·424	4·808	4·636	6·118	5·779	5·381
Cocoa	lbs.	0·11	0·12	0·13	0·13	0·14	0·14	0·17	0·19	0·20	0·23
Coffee	,,	1·23	1·18	1·06	1·02	1·02	1·04	1·00	0·94	0·98	0·97
Cotton	,,	39·63	10·57	21·88	22·57	32·79	30·00	32·78	30·41	35·23	44·90
Currants and raisins	,,	3·59	3·75	3·91	4·12	3·96	3·96	4·24	4·19	4·03	4·38
Meat	,,	—	—	—	—	—	—	100·51	100·38	101·42	106·27
Rice	,,	1·41	10·15	5·72	2·05	2·40	5·85	9·84	12·75	6·74	7·47
Sugar	,,	34·14	35·97	36·84	39·78	41·21	43·19	43·01	42·56	47·23	46·80
Tea	,,	2·67	2·70	3·00	3·29	3·42	3·68	3·52	3·63	3·81	3·92
Tobacco	,,	1·22	1·21	1·29	1·31	1·35	1·35	1·35	1·35	1·34	1·36
Wool	,,	8·65	8·82	9·87	9·22	10·52	9·69	10·16	9·38	10·09	10·47
Wine	galls.	0·22	0·33	0·39	0·40	0·44	0·45	0·50	0·48	0·49	0·51
Spirits	,,	0·93	0·83	0·90	0·94	1·01	0·99	0·98	0·98	1·01	1·00
Malt	bshls.	1·45	1·50	1·75	1·74	1·82	1·67	1·73	1·71	1·84	1·72

		1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.
Corn—wheat and wheat-flour	bshls.	4·963	5·666	5·105	6·032	5·578	5·032	5·820	6·069	4·992
Cocoa	lbs.	0·24	0·26	0·27	0·30	0·31	0·30	0·29	0·29	0·30
Coffee	,,	0·98	0·99	0·96	0·98	0·99	0·96	0·97	1·00	0·92
Cotton	,,	35·64	40·71	40·35	37·52	38·82	35·47	35·30	37·50	40·73
Currants and raisins	,,	4·74	4·29	4·48	4·29	4·73	4·18	4·49	4·29	3·92
Meat	,,	109·18	113·15	111·87	109·46	111·42	108·85	113·91	113·72	114·09
Rice	,,	13·70	11·37	10·18	11·68	10·27	12·79	7·50	11·70	14·08
Sugar	,,	47·37	51·69	56·37	62·85	58·95	64·96	58·83	66·24	63·40
Tea	,,	4·01	4·11	4·23	4·44	4·50	4·52	4·66	4·70	4·57
Tobacco	,,	1·37	1·41	1·44	1·46	1·47	1·49	1·45	1·41	1·42
Wool	,,	10·17	11·17	11·26	10·72	11·15	11·15	10·37	9·37	10·72
Wine	galls.	0·53	0·56	0·53	0·53	0·56	0·53	0·48	0·43	0·45
Spirits	,,	1·15	1·23	1·27	1·30	1·27	1·23	1·19	1·10	1·07
Malt	bshls.	1·93	1·98	1·94	1·95	2·00	1·92	1·91	1·65	—

Table V *Contd.*—*Showing Quantities of Goods Consumed per Head*, 1860-96.

		1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.
Corn—wheat and wheat-flour	bshls.	5·676	5·744	6·579	5·452	6·034	5·373	5·664	5·979	5·788
Cocoa	lbs.	0·31	0·34	0·36	0·39	0·41	0·42	0·44	0·49	0·50
Coffee	,,	0·89	0·89	0·89	0·90	0·91	0·87	0·80	0·83	0·76
Cotton	,,	42·12	43·15	41·68	41·64	33·86	41·78	40·94	39·48	44·65
Currants and raisins	,,	4·34	4·33	4·49	4·41	4·16	4·07	4·40	4·42	4·11
Meat	,,	108·33	103·28	111·56	110·36	112·52	109·22	107·43	106·97	114·97
Potatoes	cwts.	—	—	—	3·86	3·60	3·28	3·97	3·09	3·51
Rice	lbs.	16·32	13·53	12·51	9·85	7·64	10·87	7·79	9·93	10·74
Sugar	,,	67·35	70·64	72·07	72·67	74·96	66·69	74·16	71·10	77·19
Tea	,,	4·58	4·69	4·82	4·90	5·06	4·92	5·02	5·03	4·97
Tobacco	,,	1·42	1·42	1·43	1·45	1·46	1·44	1·45	1·48	1·51
Wool	,,	9·42	10·14	9·60	10·66	10·13	11·51	10·70	11·73	12·97
Wine	galls.	0·45	0·41	0·40	0·39	0·38	0·36	0·37	0·36	0·38
Spirits	,,	1·06	1·05	1·04	1·01	0·96	0·94	0·93	0·93	0·96
Beer	,,	27·79	27·63	27·25	27·80	27·09	26·90	27·27	27·21	28·88

		1890.	1891.	1892.	1893.	1894.	1895.	1896.	Quantities taken as Base, Table VIII.
Corn—wheat and wheat-flour	bshls.	5·960	6·268	6·516	6·084	5·819	6·532	5·614	5·542
Cocoa	lbs.	0·54	0·57	0·55	0·54	0·58	0·63	0·62	0·27
Coffee	,,	0·75	0·76	0·74	0·69	0·69	0·70	0·69	0·98
Cotton	,,	42·10	48·22	40·48	31·02	39·89	39·72	39·81	38·14
Currants and raisins	,,	4·70	4·82	4·58	5·02	4·90	4·97	4·95	4·39
Meat	,,	124·09	123·74*	124·66	114·23	119·77	123·73	130·39	109·92
Potatoes	cwts.	2·51	3·30	3·03	3·47	2·47	3·71	3·23	—
Rice	lbs.	9·38	8·85	8·91	8·54	7·26	8·09	6·49	10·34
Sugar	,,	73·21	80·27	77·84	78·85	80·06	88·13	85·29	56·12
Tea	,,	5·17	5·36	5·43	5·41	5·52	5·67	5·77	4·29
Tobacco	,,	1·55	1·61	1·64	1·63	1·66	1·67	1·73	1·42
Wool	,,	11·32	12·56*	11·87*	12·30*	12·93*	13·15*	13·40*	10·59
Wine	galls.	0·40	0·39	0·38	0·37	0·36	0·37	0·40	0·51
Spirits	,,	1·02	1·04	1·04	0·98	0·97	1·00	1·02	1·17
Malt	bshls.	—	—	—	—	—	—	—	1·88
Beer	galls.	30·09	30·16	29·77	29·59	29·47	29·65	30·89	27·79

* Estimated (*vide* text).

Of the above figures for cocoa, coffee, currants and raisins, rice, sugar, tobacco, wine, spirits, malt, and beer are taken directly from the " Statistical Abstracts," except that the quantities of raw and refined sugar are added together and taken as the total consumption of sugar. Since 1874, however, these sugar statistics include the proportionate amount of raw sugar refined and re-exported. The increase of exports of refined sugar directly after 1874 was about 300,000 cwts., part of which may be regarded as the natural increase due to the general good trade. There are no means of distinguishing what portion of this increase is contained in the statistics of consumption per head with which we are dealing, but

even if all the exported refined sugar was so included, the consumption per head would not be greatly affected. This is best seen by examination of the statistics for 1881. Our export of refined sugar was then at the maximum. In that year we retained 23,175,469 cwts. at home, of which some portion was refined and re-exported. Our total export of refined sugar in that year was 1,294,311 cwts., or 5·6 per cent. of the amount given as retained at home. In 1898 the quantities were—

	Cwts.
Total sugar retained at home	30,564,607
„ exports of refined sugar	736,047

or 2·4 per cent. For all practical purposes the amount of sugar erroneously included in the statistics of consumption per head may be neglected.

The statistics of cotton are obtained by taking the excess of imports over exports as the total consumption, but, as Sir Robert Giffen has pointed out,[3] "the amount of raw material consumed is "not here an absolute test. There may be more spinning and "weaving now in proportion to the same quantity of raw material "than was formerly the case," and this same remark applies also to wool. From 1860 to 1866 these figures are scarcely reliable as indicating the amount of cotton consumed, because the stocks held in 1859 and 1860 were greatly in excess of those for earlier years, but we have no means of making the desired correction.

For wheat and wheat-flour the statistics in the "Statistical "Abstract" are not those of total consumption, but only of that quantity imported and retained at home. I have, therefore, calculated the consumption per head from a table in the "Corn "Trade Year Book," wherein is estimated the net consumption per annum. The year is there taken as from 1st September to 31st August, and, to bring the figures into line with the rest, I have calculated the average variation (see Table VIII) on the assumption that one-third of the amount is consumed in the period 1st September to 31st December of the earlier year, and two-thirds in the next eight months. This "sliding" of the figures has the effect of smoothing the extreme variations caused by comparative small or large yields in certain years; otherwise the effect on the figures is small.

Turning next to meat, the "Year Book of Commerce, 1892," gives an estimate of the amount consumed per head from 1868 to 1890, "founded on the calculation submitted by Major Craigie to "the Economic Section of the British Association in 1884." Major Craigie very kindly sent me an estimate for the years 1892-96, handed in by Mr. T. H. Elliott, C.B., to the Committee on Agricul-

[3] In the Presidential Address to Section F, British Association, 1887. *Vide* "Report," p. 809.

tural Produce (Marks) Bill,[4] and based on the formula which has been used by the Board of Agriculture since 1871. This formula assumes "that for every 1,000 living cattle of all ages, about "67 tons of beef or veal are available in a year; for every 1,000 "living sheep enumerated, $12\frac{1}{2}$ tons of mutton or lamb; and for "every 1,000 living pigs, $69\frac{1}{2}$ tons of bacon, ham, or pork." The Agricultural Returns give the number of cattle yearly, and the net imports are given in the "Statistical Abstract." For 1891 we have the following :—[5]

	Tons.
Beef or veal	760,027
Mutton or lamb	419,175
Bacon, ham, or pork	296,957
Net imports	611,825
Total supply	2,087,984

or 123·74 lbs. per head.

The estimates given by Mr. Elliott are :—

Total Supply of Meat.

	Tons.	Lbs. per Head.
1892	2,122,000	124·66
'93	1,960,000	114·23
'94	2,073,000	119·77
'95	2,156,000	123·73
'96	2,297,000	130·39

I have been unable, for reasons explained below, to include potatoes in Table VIII, but the material for an estimate of the consumption of potatoes is given in the "Statistical Abstract" since 1884 as follows :—

TABLE VI.—*Showing the Consumption of Potatoes,* 1884-98.

Year.	Totald Yield.	Net Imports.	Total Supply.	Consumption per Head.	Average Variation 1884-92 = 107.
	cwts.	cwts.	cwts.	cwts.	
1884	135,671,100	2,425,611	138,096,711	3·86	123
'85	127,484,840	2,291,133	129,775,973	3·60	115
'86	116,709,740	2,688,660	119,398,400	3·28	104
'87	142,685,920	2,714,590	145,400,510	3·97	126
'88	111,646,620	2,333,593	113,980,213	3·09	98·5
'89	128,707,740	1,845,442	130,553,182	3·51	117
1890	92,444,280	1,917,729	94,362,015	2·51	80
'91	121,800,940	3,152,916	124,953,856	3·30	105
'92	112,679,080	2,962,804	115,641,884	3·03	96·5
'93	130,811,960	2,795,418	133,607,378	3·47	110
'94	93,242,940	2,659,833	95,902,773	2·47	79
'95	141,292,780	3,746,572	145,039,352	3·71	119
'96	125,264,700	2,204,577	127,469,277	3·23	103
'97	82,132,180	3,884,609	87,016,789	2·18	69·5
'98	124,495,600	6,707,223	131,202,823	3·26	103·5

[4] "Report," p. 197.   [5] From these sources.

Here the annual variation is seen to be extreme, and this without any allowance for seed. The potato harvest being in the middle of the year, we might, I believe, correctly assume that one-half of the supply in one year should be carried over and added to one-half of that of the next to give the correct figure. This is borne out by examination of the import statistics, where it is seen that a large increase occurs in each case the year after that of the failure of the home harvest, showing that stocks were consumed quickly, and consequently an increased demand was made for foreign goods. But even if we average the figures in this way, the fluctuations are so great as to make it impossible to find a satisfactory base so as to include a line for potatoes in Table VIII. The column of average variations is worked out on the basis of 1884-92 inclusive = 107, which is the percentage level indicated by the unweighted average for the period in Table VIII. But the average of 1893 and 1894 is 94·5, seventeen points below the average of the column for 1894 in Table VIII, or sufficient to reduce the unweighted index of consumption by one point. If we had the statistics of the net supply from the commencement of our period we should have no difficulty, but as it is, I reluctantly omitted potatoes altogether.

The other figures not taken directly from the "Statistical "Abstract" are those for wool. From 1860-90 an estimate of the total amount available annually is quoted in the "Year-Book of "Commerce" from Messrs. Helmuth, Schwartze, and Co.'s "Annual "Wool Reports." In the latter year the home production was 138 million lbs., and the imports 650. Having no means at hand of estimating the annual home production since 1890, I have been forced to assume a stationary home production of 3·68 lbs. per head, and to make an estimate of total consumption as follows :—

TABLE VII.—*Estimated Home Consumption of Wool.*

Year.	Excess of Imports over Exports.	Lbs. per Head.	Estimated Home Production, lbs. per Head.	Estimated Total Consumption, lbs. per Head.
1890	292,315,828	7·79	3·68	11·47
'91	335,789,444	8·88	3·68	12·56
'92	312,217,111	8·19	3·68	11·87
'93	331,578,554	8·62	3·68	12·30
'94	359,540,904	9·25	3·68	12·93
'95	370,443,837	9·47	3·68	13·15
'96	383,845,972	9·72	3·68	13·40

The number of sheep given annually shows a slight decline since 1890, but even if the home production has fallen off by 10 per cent. (probably the maximum), this will not affect the total estimated consumption by more than 3 per cent., an amount which has a still smaller effect on the averages given of the annual consumption in Table VIII.

Having proceeded so far, the problem here set for solution is, " Given these statistics, which have only one common measure, " viz., their relative values, can we arrive at a definite, consistent " and reliable index-number with them ? " At the first step, that of turning them into percentages of a common period or year, we are met with the difficulty that with a set of figures, some of which move more quickly than, or in opposite direction to, the rest, choice of date is equivalent to the choice of a system of weights in which at a given time each commodity has equal effect on the result, and at all other times has an effect varying with the difference between its own movements and the movements of the average of the remainder. An example will make clear this difficulty. Take cocoa. The amount of cocoa consumed per head in 1860 was 0·11 lb.; 1870, 0·20 lb.; 1880, 0·30 lb.; 1890, 0·54 lb. If we take 1860 as 100, 1890 equals 499, and assuming that the average of fourteen other commodities is 140, cocoa here has power to raise this figure to $359 \div 15$ or to 163·96. If, however, 1870 is selected as base, the effect is less. Cocoa here stands at 270, and if the other fourteen commodities average 120, the increase due to the inclusion of cocoa is 10 points. Working backwards, however, the power of one commodity to depress the rest is limited. If 1890 is taken as base, the percentage in 1860 of cocoa is 20·4, and if with fourteen commodities the average is 60, the inclusion of cocoa lowers the average only to 57·3. For these reasons I have chosen as my base the average quantity consumed of each commodity in the decade 1870-79. A fairly long period gives no undue prominence to transient fluctuations, and by selecting a middle period, those sets which run across the average, either upwards or downwards, tend to balance each other. The following table shows the variations of each commodity in terms of 1870-79 = 100, and the results of sets of averages weighted and unweighted.

TABLE VIII.—*Showing Annual Variations in Consumption of the Undermentioned Commodities.*

[Average of 1870-79 inclusive taken as 100.]

	1860.	1862.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.
Wheat and wheat flour	94	103	106	99	94	86	93	108	101	94
Cocoa	41	44	48	48	52	52	63	70	74	81
Coffee	125	120	108	104	104	106	102	96	100	99
Cotton	104	27	51	59	86	78	86	79	92	117
Currants and raisins	82	85	89	93	90	90	96	95	92	100
Meat	—	—	—	—	—	—	91	91	92	97
Rice	54	56	57	37	21	40	75	109	93	68
Sugar	60	64	65	71	74	77	77	76	84	83
Tea	62	63	70	76	80	86	82	85	86	91
Tobacco	86	85	91	92	95	95	95	95	94	96
Wool	82	83	93	87	99	91	96	88	96	99
Wine	43	65	76	78	86	88	98	94	96	100
Spirits	80	71	77	81	86	84	83	83	86	85
Malt and beer*	77	79	93	92	96	89	92	91	98	91
Unweighted average	*76·1*	*72·7*	*80·2*	*78·2*	*81·7*	*81·7*	*87·8*	*90·0*	*91·4*	*93·0*
Average, weighted by—										
System 1	80·8	73·9	83·0	83·6	89·2	86·7	89·8	90·0	92·8	96·4
„ 2	82·5	78·9	86·9	83·8	87·3	83·5	89·5	92·8	93·7	95·8
„ 3	81·5	77·1	85·5	82·6	86·8	83·3	89·3	92·0	93·4	95·7
„ 4	84·8	78·8	87·2	84·1	88·4	84·5	89·8	92·8	93·9	96·0
„ 5	83·9	78·2	86·9	84·3	88·8	85·3	89·9	92·3	93·7	96·1

	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.
Wheat and wheat-flour	93	99	97	106	97	96	106	103	95	102
Cocoa	85	96	100	101	115	111	107	107	111	115
Coffee	100	101	98	100	101	98	99	102	94	91
Cotton	97	107	106	98	102	93	101	98	107	110
Currants and raisins	108	97	102	97	108	95	102	97	89	99
Meat	100	103	102	100	101	99	104	103	104	98
Rice	102	121	104	105	105	111	97	92	124	147
Sugar	84	92	100	112	105	115	104	118	112	119
Tea	93	95	98	103	105	105	109	110	106	106
Tobacco	96	99	101	103	103	105	102	99	100	99
Wool	96	105	106	101	105	109	98	88	101	89
Wine	103	109	104	104	109	103	93	84	88	88
Spirits	95	105	108	111	108	105	102	94	91	90
Malt and beer*	102	105	103	104	106	102	101	88	—	100
Unweighted average	*96·4*	*102·4*	*102·0*	*104·0*	*105·0*	*103·3*	*101·6*	*98·8*	*101·8*	*103·8*
Average, weighted by—										
System 1	96·1	100·2	101·7	102·7	103·5	103·2	101·9	100·4	101·7	102·4
„ 2	95·6	101·4	101·0	103·0	102·3	100·7	103·5	101·5	102·0	102·1
„ 3	95·5	101·4	101·2	103·0	102·7	101·1	103·4	101·3	102·3	102·6
„ 4	96·1	101·5	101·0	102·9	101·6	100·7	103·5	101·5	102·1	102·0
„ 5	96·8	101·5	101·2	102·6	102·1	101·8	103·6	101·5	102·4	101·3

* Malt to 1879 ; beer, 1881 ff.

TABLE VIII *Contd.—Showing Annual Variations in Consumption of the Undermentioned Commodities.*

[Average of 1870-79 inclusive taken as 100.]

	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.
Wheat and wheat-flour	109	112	101	105	98	104	106	105	109	114
Cocoa	126	134	146	152	155	163	181	185	200	211
Coffee	91	91	92	93	89	82	85	78	77	78
Cotton	113	109	108	89	109	107	103	117	110	126
Currants and raisins	99	102	100	94	92	100	100	93	107	110
Meat	94	101	100	102	100	98	97	105	113	112
Rice	145	126	108	84	89	90	85	100	97	88
Sugar	125	128	129	133	119	132	126	137	130	143
Tea	109	112	114	118	114	117	117	116	120	125
Tobacco	100	101	102	102	101	102	104	106	109	113
Wool	96	91	101	96	109	101	111	122	107	117
Wine	80	78	76	74	70	72	70	74	78	76
Spirits	89	88	86	82	81	80	80	82	87	88
Malt and beer*	99	98	100	97	96	98	98	102	108	108
Unweighted average	*105·3*	*105·0*	*104·5*	*101·5*	*101·5*	*104·0*	*104·5*	*108·7*	*110·8*	*114·9*
Average, weighted by—										
System 1	104·9	106·0	106·1	104·0	104·2	106·5	106·9	111·4	112·5	118·5
,, 2	104·3	106·6	104·6	104·0	103·5	104·8	105·8	110·8	113·3	117·8
,, 3	104·6	106·6	105·0	104·0	104·0	105·2	106·3	111·5	113·5	118·4
,, 4	104·1	106·2	104·1	103·4	102·6	103·9	104·5	109·8	111·6	116·2
,, 5	103·6	105·6	104·0	103·5	103·1	103·9	104·5	110·2	112·4	116·6

	1892.	1893.	1894.	1895.	1896.	Systems of Weights.				
						1.	2.	3.	4.	5.
Wheat and wheat-flour	115	108	109	112	104	1	25	20	25	22
Cocoa	204	200	214	233	229	—	3	3	1	1
Coffee	76	71	71	72	71	—	2	2	2½	1
Cotton	106	81	104	103	104	1	8	8	9	8
Currants and raisins	104	114	112	113	113	1	1½	1½	1	1
Meat	113	104	109	112	118	1	30	25	30	36
Rice	86	83	76	73	70	—	2	2	2	1
Sugar	138	140	142	157	152	1	6	6	6½	6
Tea	126	126	128	132	134	1	5	5	6½	6¼
Tobacco	115	115	117	117	122	1	4	4	2½	2¼
Wool	111	114	120	122	125	1	9	9	9½	10
Wine	74	72	70	72	78	—	-½	-½	-½	-¼
Spirits	88	83	83	85	86	—	1	1	1	-¾
Malt and beer*	107	106	106	106	111	1	3	3	3	4
Unweighted average	*111·4*	*108·3*	*111·5*	*114·9*	*115·5*	—	100	90	100	100
Average, weighted by—										
System 1	115·0	112·0	116·3	119·3	120·3					
,, 2	115·7	109·4	114·1	117·5	117·6					
,, 3	115·8	109·8	114·5	118·1	118·4					
,, 4	114·0	107·6	112·1	115·3	115·5					
,, 5	114·7	108·2	113·1	116·3	117·2					

* Malt to 1879 ; beer, 1881 ff.

I have given in full the results from four systems of weighting, because they seem excellent as an illustration of the closeness of results obtainable from the same set of figures when different systems of weights are used.   Of the systems the first simply selects those commodities which may be termed of greatest importance, either as absolute necessaries or as luxuries in general use, and gives an unweighted average.   I have done this because all the others act more or less as disturbing elements, crossing the general trend either upwards or downwards.   Cocoa, coffee, wine, and rice especially come under this category, and it is desired to know whether their movements balance each other and leave the general unweighted average comparatively unaffected.   From 1868 onwards (the first year in which we have our statistics complete) the variation of the unweighted average of the whole from the average of nine chief commodities is small, except at the very end, where it reaches 4·5, an amount directly traceable to the influence of sugar and tea.

The next system of the weights is arbitrary, and the third is exactly similar to the second, except that corn and meat are less heavily weighted, and the influence of the rest is proportionately increased; the third is arbitrary also, but increases the influence of tea, sugar, wool, cotton and coffee, at the expense of cocoa and tobacco.   The best method of weighting I can think of is by applying the relative amounts spent on each commodity as denoted by workmen's budgets.   Unfortunately it is nearly impossible to procure such weights, but Mr. Charles Booth gives the expenditure of an average family in each of his four classes,[6] and the system of weights in Col. 5 is adapted from his budget of Class E. This would be typical of the expenditure of this class at the end of our period, but changes by substitution of one commodity for another, as for instance cocoa for coffee, prevent it from being typical in 1860, though the general consilience of the averages leads me to think that whatever system of weights is adopted, no great divergence from the unweighted average will be shown if meat, corn, and clothing are proportionately more heavily weighted than the rest.

A detailed examination of these results shows that the extreme variation in the results for any individual year is 8·7, which occurs in 1860, and is doubtless due to the inflated figure for cotton, while the next greatest divergences are 7·5 in 1866, 6·2 in 1862, and 6·1 in 1864, each of these being during the cotton famine period, when, without the steadying influence of meat, our results would be expected to vary greatly.   It is to

6 " Life and Labour," vol. i, p. 138.

be noticed, however, that even when we find the extreme varia-
tions in the averages, their respective courses remain unaffected
and follow one another with regularity. In all we find a
variation of :—

> 5 or more occurring 5 times.
> 4   ,,   ,,   10   ,,
> 3   ,,   ,,   15   ,,

and the average of the extreme annual variation is 3·3, the average
variation from the mean being 1·6.

There seems no reason why these commodities should not be
of sufficient importance to justify the assumption that they are
indicative of the general course of the consumption of the working
classes. Wine is the only exception; a commodity which has
zero influence on the weighted averages. Sir Robert Giffen, in
his address to this Society in 1883, when discussing a table
showing the increase in the consumption of most of these articles
over the period 1840-81, said : "There could be no better evidence
" of diffused material well-being among the masses. The articles
" are not such that the increased consumption by the rich could
" have made much difference. It is the consumption emphatically
" of the mass which is in question."[7]

Butter, cheese, and eggs could have been included if statistics
of home production had been available, while other commodities,
the inclusion of which would perhaps add to the value of the index-
number, are milk, fish, vegetables, oatmeal, &c. But as we have
the most important necessaries and a number of luxuries of
varying importance, it is in my opinion doubtful[8] whether the
result so obtained would differ materially from that which is
shown in Table VIII.

In attempting to measure the increase of consumption over
any period longer than ten years, it is best to remove annual
fluctuations by taking the averages of short periods, so that
individual depressions or inflations due to the rapid movements
of single commodities may have only a normal effect. The
following table shows the averages arrived at for each quinquennial
period by the various systems of weighting.

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[7] " Progress of the Working Classes," p. 17, and *Journal*, part iv, 1888.

[8] For instance, including only the *net imports* per head for 1890 of butter and
margarine 177, cheese 126, and eggs 166, and the total consumption of potatoes
98, the unweighted average for the year would only be 117 against 110, while the
weighted average if each of these were given weights suggested by examination
of budgets would be appreciably less.

TABLE IX.—*Averages of Consumption of Commodities in Quinquennial Periods.*

	1860–64.	1865–69.	1870–74.	1875–79.	1880–84.	1885–89.	1890–94.	1895–96.
Unweighted average	76·3	83·9	97·1	102·5	104·1	104·0	111·4	115·2
Weighted system 1	79·2	87·8	97·4	102·3	104·2	106·6	114·8	119·6
,, ,, 2	82·7	87·4	97·5	102·2	103·9	105·7	114·0	117·5
,, ,, 3	81·4	87·0	97·4	102·3	104·2	106·2	114·4	118·2
,, ,, 4	83·6	87·9	97·7	102·0	103·7	104·8	112·3	115·4
,, ,, 5	83·0	88·1	97·8	102·0	103·3	105·0	115·0	116·7

One question remains yet to be discussed, and that is, what advance can be attributed over the whole period? This table indicates the advances as follows :—[9]

TABLE X.

	1860–64.	1875–79.	1890–94.	1895–96.
Unweighted average	100	134	146	151
Weighted system 1....	100	129	144	151
,, ,, 2....	100	124	138	142
,, ,, 3....	100	125	140	146
,, ,, 4....	100	122	134	138
,, ,, 5....	100	123	139	140

As a change of base is equivalent to a change of weights, and in the case of a series of miscellaneous sets of numbers, some of which run in contrary direction to the rest, the higher the numbers taken as base the less is the average increase shown, I have calculated the rates of increase by the same methods of weighting with the average of 1860-64 taken as = 100 for each commodity, with the following result :—

	1860–64.	1895–96.
Unweighted average	100	168
Weighted system 1	100	156
,, ,, 2	100	152
,, ,, 3	100	155
,, ,, 4	100	146
,, ,, 5	100	147

In this case, those commodities which starting at a low figure (as sugar, tea, and especially cocoa) rise greatly above the average,

[9] To nearest whole number.

have an influence on the result greatly out of proportion to their importance, and the averages are therefore not trustworthy as measurements over the whole. This is especially clear when the unweighted average is compared with the weighted, but in the case of these latter their general agreement is close enough to justify the statement that over the whole period under review the average level of consumption of these commodities rose by 45 per cent., with an error of probably ± 5 per cent., possibly ± 10 per cent. The closeness of the results of the four systems of weights in either case seems to show that the quantity which we wish to measure, viz., the per cent. increase of consumption, is within these limits, as the mean of the two sets of averages is 145, and the number with the greatest variation from this figure, which we have been able to make by adopting various systems of averaging is the 155 arrived at by system three on the averages of 1860-64 taken as base. The proportionate increase by 1875-79 may be even more nearly ascertained, it being according to any of these methods within 6 of 60 per cent. of the whole, or an advance of 27 per cent. At its highest point in this period the increase over 1860-64 was of course higher, but except for the last year, 1879, the period was practically stationary — the unweighted average showing greatest signs of movement. To sum up this section of our inquiry, there are signs that the level of consumption of commodities increased over the period 1860-69 by about 7 per cent.; then a rapid increase set in, and during the period 1870-74 the level rose by 20 per cent., declining in 1879-81, and fluctuating at or about a net increase since 1860-64 of 28 per cent. In 1888-89 another rapid rise set in, which made the net increase by 1892-93 about 40 per cent. A depression in the latter year caused a retardation of the progress, but in 1895-96 there was a return to about the former level, and at the end of our period the net increase may be placed at or about 45 per cent. With these three curves are shown in the following diagram the number per 10,000 of the population of indoor pauperism[10] and the marriage-rate per 5,000 of the population.

I have drawn the diagram[11] to logarithmic scale, as I believe this method will add to its value, through the ease with which percentage movements over periods can be measured by it.

We do not need a very detailed examination of the five curves shown, to see how far-reaching in their consequences are those

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[10] *Cf.* Appendix.

[11] *Note as regards diagram :*—After 1886 the upp r employment curve is that of the Unions given in the text, and the lower continued to 1896 is the Board of Trade percentage (*vide text*). In the second curve the word " con- " sumption " means " consumption of commodities."

Wages

Consumption

Employment

Marriage rate per 1000 of the population

Total Indoor Pauperism per 10,000

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phenomena which we term trade depressions and trade expansions. The interdependence of social movements could scarcely be better illustrated. Scarcely a movement in either of the four upper curves is not reflected in the others, but what we cannot easily learn from our diagram is, " which curve represents the " cause and which the effect ? " and the only conclusion to which I have been able to come is that some outside influence, probably price movements, acts as cause, and the variations in our curves are either direct or indirect effects. But movements of consumption of commodities appear to depend more largely on movements of the level of employment than on any other factor, the reason being, possibly, that an average fall of wages of 10 per cent. leads to retrenchment in other ways than would have effect on our consumption curve ; but 10 per cent. of the trade union members being totally unemployed means a necessary economy on every hand by those who are unfortunate enough to be so unemployed. Usually, the semi-luxuries, as tea, currants, and raisins, tobacco, beer, spirits, with clothing suffer first, but when meat cannot be bought, bread must. In 1877-80, for instance, cocoa, cotton, currants, raisins, tobacco, wool, spirits and beer all declined, while tea increased by only 1 per cent. In 1888-91, which period may be termed the nearest approach to an inflated period for nearly twenty years, cotton, currants, and raisins, meat, sugar, tea, tobacco, spirits, beer, and even wine, increased at a rapid rate, clearly showing that when the power to procure these commodities is increased the desire to consume more exists, or in other words, the demand schedule of the working classes has not yet reached its final limit.

I have drawn the marriage-rate and pauperism curves to show that they correspond with the general fluctuations, though no sound argument relating to economic progress over a long period can be based on these, without considering the moral factors which have tended materially to alter their shapes.

An important discussion on which the diagram may throw some light is, " what constitutes (or denotes) a trade depression ? " The opinion which has formed itself in my mind whilst engaged on this paper is, that when 5 per cent. or more of the total number of trade unionists (which possibly may imply 8 per cent. or more of the total wage earners) are unemployed, then more time is being lost than is usually involved in passing from a completed job to a new one, or then the workman has to waste more than a normal amount of time looking for employment, and trade may be said to be depressed. If we say that 5 per cent. unemployed indicates a state of depression, the following years have been depressed since 1860, viz., 1862-63 (a merely temporary depression due to extraordinary causes, *i.e.*, the cotton stoppage), 1867-69 ; 1877-80 ;

1884-87; and 1892-95. Many trade union officials hold the view
that trade depressions are more frequent now than formerly, and
that the cycle which formerly lasted ten years, now lasts seven or
eight. There seem good grounds for this view, for since 1877
we have been through three trade depressions in twenty-two
years, and if, as I believe it is, the average percentage of workmen
seeking employment is greater over a decade now, than before
the depression at the end of 1870-79, this is entirely due to this
greater frequency of trade depressions.

To conclude this inquiry; the general results are somewhat as
follows:—In money wages there has been an advance of about
40 per cent., although we are not yet[12] at a higher level than that
which obtained in 1873 or 1874—when the inflation was at its
highest. In real wages we have not the means of calculating the
improvement, and although there must necessarily have been a
substantial amount, it cannot be the 105 per cent. increase obtained
by assuming that every fall in the general level of wholesale
prices is gained to the full in the purchasing power of the
workman; or if so, it may well be asked, why have not the wage-
earners been able to increase their consumption of commodities by
more than 45 or 50 per cent.? which is nearly the amount
of increase shown to have taken place, and a large amount
of which actually took place when wholesale prices were rising
and consequently real wages, calculated on this basis, were either
stationary, or only rising by small steps. Employment is certainly
not more regular, but seemingly is less so, and on the whole we
seem, therefore, safe in saying that all these phases of our subject
are in a general agreement, and that though there has been a real
advance in the standard of living, only in the present decade have
the signs of progress equalled those of the first fifteen or sixteen
years of our period. Such a limited progress over a long period as
between 1877-88 contrasts unfavourably with the previous rapid
growth, and accounts very largely for the expressions of dissatis-
faction with our present system which are often to be heard,
especially where thoughtful and earnest members of the wage-
earning class congregate. It is to be earnestly hoped that the
progress during the present decade will not be succeeded by stag-
nation, as was the progress of 1860-75, but I fear that this is quite
possible, if not probable.

[12] *I.e.,* 1896, the date at which these investigations end.

APPENDIX I.

Table Showing the Quinquennial and Decennial Average Level of the Consumption of Commodities, 1870-79 = 100.

	1860–64.	1865–69.	1860–69.	1870–74.	1875–79.	1870–79.
Wheat	101	96	98	97	103	100
Cocoa	44	57	50	87	113	100
Coffee	118	110	114	100	100	100
Cotton	61	73	67	102	98	100
Currants and raisins	85	93	89	100	100	100
Meat	—	91	—	99	101	100
Rice	56	56	56	98	102	100
Sugar	63	75	69	89	111	100
Tea	65	82	73	93	107	100
Tobacco	87	95	91	97	103	100
Wool	86	92	89	100	100	100
Wine	61	89	75	102	98	100
Spirits	76	83	80	96	104	100
Malt and beer	83	92	87	100	100	100
Average unweighted	76	84·5	80	97	103	100
Per cent. increase over 1860-64	—	11	—	27	35	—

	1880–84.	1885–89.	1880–89.	1890–94.	1895–96.	1890–96.
Wheat	104	104	104	111	108	110
Cocoa	126	167	147	206	231	213
Coffee	92	85	89	75	71	74
Cotton	109	105	107	105	104	105
Currants and raisins	98	96	97	109	113	110
Meat	100	100	100	110	115	111
Rice	130	90	110	86	71	82
Sugar	122	129	126	138	154	143
Tea	109	116	113	125	133	127
Tobacco	100	103	102	114	120	115
Wool	95	108	102	114	123	116
Wine	82	72	77	74	75	74
Spirits	89	81	85	86	85	86
Malt and beer	99	98	99	107	108	107
Average unweighted	104	104	104	111	115	112
Per cent. increase over 1860-64	37	37	—	46	51	—

APPENDIX II.

Showing Variations in Wages

Year.	Agriculture. England.	Compositors.			Building Trades.				Sailors.
		London.	Edinburgh.	Bristol.	London Bricklayers.	Labourer.	Edinburgh, Carpenter.	Glasgow, Mason.	
1860	90	92	81	83	86	78	64	79	70
'61 ...	91	,,	84	,,	,,	,,	70	75	,,
'62 ...	,,	,,	,,	,,	,,	,,	70	,,	,,
'63 ...	,,	,,	,,	,,	,,	,,	,,	,,	,,
'64 ...	,,	,,	,,	,,	,,	,,	67	,,	72
'65 ...	,,	,,	,,	,,	91	82	71	89	73
'66 ...	,,	100	89	,,	96	85	80	87	79
'67 ...	93	,,	,,	,,	,,	,,	,,	90	75
'68	95	,,	,,	,,	,,	,,	,,	,,	,,
'69	96	,,	,,	,,	,,	,,	83	87	72
'70	97	,,	,,	,,	,,	,,	,,	,,	72
'71 ...	105	,,	,,	87	,,	,,	,,	,,	75
'72	114	,,	96	,,	100	,,	87	93	85
'73	118	,,	,,	,,	,,	89	93	100	90
'74	124	,,	,,	,,	99	96	100	107	,,
'75	118	,,	,,	,,	102	,,	106	113	,,
'76	,,	,,	,,	,,	113	,,	115	126	,,
'77	,,	,,	,,	,,	,,	,,	115	,,	85
'78	115	,,	,,	93	107	,,	100	88	82
'79	108	,,	,,	,,	106	,,	57	80	71
'80 ...	104	,,	,,	,,	,,	,,	87	,,	,,
'81	101	,,	,,	,,	,,	,,	,,	88	79
'82	98	,,	100	,,	,,	,,	,,	93	82
'83	,,	,,	,,	,,	,,	,,	,,	100	,,
'84	97	,,	,,	,,	107	,,	,,	93	80
'85	95	,,	,,	,,	,,	,,	,,	,,	78
'86	93	,,	,,	,,	106	100	,,	,,	77
'87	,,	,,	,,	,,	,,	,,	93	,,	75
'88	98	,,	,,	,,	,,	,,	,,	,,	79
'89	99	,,	,,	,,	100	,,	,,	96	91
'90	100	100	100	100	100	100	100	100	100
'91 ...	101	105	102	,,	,,	,,	,,	103	100
'92 ...	103	,,	104	,,	,,	102	103	110	—
'93	102	,,	,,	,,	,,	104	,,	113	—
'94	102	,,	,,	,,	101	,,	106	,,	—
'95	101	,,	,,	,,	,,	,,	,,	117	—
'96 ...	99	,,	,,	,,	106	,,	115	120	—
Wage in 1890....	15s.	36s.	31s. 3d.	30s.	38s. 5d.	26s.	31s. 10d.	31s. 10d.	78s. monthly

APPENDIX II.

of Seventeen Sets of Workmen.

Iron.				Coal.			York-shire. Glass Bottle Makers.	Average.	Ad-justed.	Year.
Amal-gamated Society of Engineers.	Iron-moulders, Scotland.	Steam Engine Makers.	Pud-dlers.	Collier, Lanark-shire.	Northum-berland.	Engine-man, Lanark-shire.				
90	83	60	80	56	—	53	—	79 to 76	72	1860
92	—	—	,,	52	—	,,	—	,,	72	'61
,,	—	—	—	50	—	56	—	,,	72	'62
,,	—	67	—	58	66	,,	—	80 to 76	73	'63
,,	—	—	—	64	,,	,,	—	80	74	'64
,,	—	—	110	65	,,	,,	—	83	77	'65
95	—	—	102	72	—	59	—	86	81	'66
,,	—	—	—	70	—	63	100	87	82	'67
,,	—	73	93	57	—	55	,,	85	79	'68
,,	—	—	98	,,	—	60	,,	86	79	'69
,,	—	—	102	60	—	63	,,	87	81	'70
,,	102	—	108	72	81	,,	,,	90	84	'71
,,	94	80	142	112	111	73	110	100	94	'72
,,	88	—	124	160	137	87	120	105	103	'73
,,	92	87	114	115	116	93	,,	102	99	'74
,,	,,	—	100	85	97	92	,,	99	97	'75
,,	,,	—	—	75	90	87	110	96	'76	'76
,,	,,	—	70	66	90	88	,,	98	95	'77
,,	,,	—	85	51	76	97	100	92	92	'78
,,	,,	80	—	72	60	85	90	89	89	'79
,,	91	—	90	79	64	84	,,	,,	89	'80
,,	,,	—	—	72	,,	82	,,	,,	90	'81
100	,,	87	—	,,	71	,,	,,	91	92	'82
,,	,,	—	88	81	72	80	100	93	93	'83
,,	99	—	85	72	71	,,	,,	92	92	'84
,,	,,	87	80	65	63	81	,,	90	91	'85
,,	89	—	80	61	59	,,	,,	89	90	'86
,,	,,	—	—	68	69	,,	,,	90	91	'87
,,	100	—	85	67	,,	79	,,	91	91	'88
,,	,,	—	—	84	79	84	,,	95	95	'89
100	100	100	100	100	100	100	100	100	100	'90
,,	99	—	—	,,	—	104	—	101	101	'91
--	,,	—	—	91	—	,,	—	,,	,,	'92
—	—	—	—	100	—	,,	—	102	102	'93
—	—	—	—	84	—	,,	—	101	101	'94
—	—	—	—	76	—	,,	—	,,	,,	'95
—	—	—	—	76	—	—	—	102	100	'96
38s.	35s.	30s.	—	6s. 3d. daily	33s. 5d.	31s. 10d.	30s.	—	—	Wage in 1890

APPENDIX III.

Comparative Statistics Relating to Economic Progress.

	Marriage-Rate per 1,000.	Total In-door Pauperism per 1,000.*	Mr. Sauerbeck's Index-Number of Wholesale Prices, 1867-77 = 100.	Real Wages Calculated on the Basis of the Fall of Wholesale Prices. 1870 = 100.	Value per Head of Imports and Exports.		
					£	s.	d.
1860	17·1	5·45	99	86	—		
'61	16·3	6·16	98	88	—		
'62	16·1	6·60	101	84	—		
'63	16·8	6·60	103	84	—		
'64	17·2	6·23	105	83	—		
'65	17·5	6·16	101	91	16	8	2
'66	17·5	6·04	102	93	17	15	2
'67	16·5	6·27	100	96	16	1	3
'68	16·1	6·84	99	95	17	1	3
'69	15·9	6·93	98	96	17	4	6
1870	16·1	6·94	96	**100**	17	10	10
'71	16·7	6·80	100	99	19	10	1
'72	17·4	6·17	109	101	21	—	6
'73	17·6	5·95	111	105	21	4	9
'74	17·0	5·76	102	110	20	11	10
'75	16·7	5·82	96	114	20	—	4
'76	16·5	5·56	95	115	19	1	11
'77	15·7	5·80	94	115	19	6	9
'78	15·2	6·11	87	116	19	3	6
'79	14·4	6·37	83	118	17	18	3
1880	14·9	6·82	88	111	20	3	—
'81	15·1	6·72	85	115	19	17	5
'82	15·5	6·59	84	119	20	8	10
'83	15·5	6·58	82	125	20	13	2
'84	15·1	6·39	76	133	19	4	1
'85	14·5	6·42	72	138	17	16	9
'86	14·2	6·52	69	142	17	—	10
'87	14·4	6·52	68	146	17	11	8
'88	14·4	6·59	70	143	18	12	2
'89	15·0	6·42	72	145	19	19	10
1890	15·5	6·25	72	153	19	19	7
'91	15·6	6·11	72	155	19	14	—
'92	15·4	6·02	68	163	18	15	6
'93	14·7	6·21	68	165	17	14	10
'94	15·1	6·58	63	177	17	11	10
'95	15·0	6·61	62	180	17	19	3
'96	15·8	6·58	61	184	18	14	1

* Lunatics and vagrants omitted.

Discussion *on* Mr. Wood's Paper.

Mr. George Howell suggested that it would be advisable to test the figures as to the numbers of unemployed by the amount expended in unemployed or donation benefit, because the number of unemployed as given in the Trade Union Returns referred to those who were sufficiently long out of work to obtain unemployed benefit. That varied to some extent in different unions. The shortest time to be found was in the Scottish unions, where if a man was idle for over three days in a week he was entitled to what is called idle benefit. That would to some degree affect the figures. The figures given in the Trade Union Returns must be taken as referring in all cases to the men who were not permanently out of work. They referred to those who might be out of work for a few days and then in again for weeks. Consequently the numbers given comprised those who might be on the fund only for a few days during the month. His second point showed the insufficiency of the data upon which the author relied. The period of 1875-79 was referred to as a period not of very great depression, as compared with other periods. Now, in reality, there was never a period during the century when trade was so greatly depressed as in the latter part of the decade ending in 1879. Some of the best and largest trade unions of the country were almost on the point of bankruptcy, and actually had to borrow money from their members in order to keep those who were superannuated, and who were almost permanently out of work. It was a long period of absolute depression, in which not only were great numbers out of work and coming on the funds, but they remained on the funds the full period during which they were entitled to relief and even sometimes beyond. So the figures relating to the amount paid in donation benefit must be used to correct some of the figures with regard to the numbers out of work. Average payments might be taken as 9s. a week. From the amount paid in donation benefit divided by the number of days in the year—an allowance being made for pay at this average rate— a more accurate average of the number out of work would be reached than was afforded by the figures given in the Trade Union Report. The speaker referred to the progress which the Labour Department of the Board of Trade had made, and said that their publications were now comparable with those issued by the United States Department.

Mr. H. Llewellyn Smith said he might begin by expressing the great interest with which he had listened to this thoughtful paper on a subject of most absorbing interest. The table on p. 639 showed the variation in money wages over a long period of time, since 1860. For that they were indebted to Mr. Bowley's

work ; and, if he said anything in criticism of any of those figures, it would not be in any way derogatory of that work, but merely to show how exceptional causes might sometimes make figures for particular years, constructed on this principle, to be misleading. Wages were made to rise between 1892-93 from 101 to 102, and then gradually to fall from 1893 to 1896, when they got down to 100. That seemed strange, because 1893-94 marked the lowest point of depression, and since then things had been gradually improving, and rising wages would naturally be expected. On turning to the Appendix the key to the mystery was found. It was seen that for the great coal mining industry the figures relied on were those from collieries in Scotland. Now the year 1893 was the year of a very widespread dispute, by which English mining was paralysed. Scotch miners, consequently, could then obtain exceptionally high wages. During 1894-95 these wages were tumbling down from the point reached in that period of accidental inflation, and he suggested therefore that the curious result that wages appeared to go up in 1893, and had been falling since, was partly due to the disproportionate weight given to the Scotch miners' wages, which changed in that accidental fashion from a cause totally apart from the state of the general labour market.

In regard to the statistics on unemployment, the author had taken three sets of figures. First, those based on the fifth trade union report; secondly, the statistics formed from the monthly figures of the numbers of unemployed published by the trade unions; and, lastly, the figures published month by month in the *Labour Gazette* by the Board of Trade. All these figures, of course, were ultimately derived from the same source—the numbers reported by the unions themselves as out of work. They were thus only of limited value for checking one another. It was quite true that in the Appendix to the Board of Trade report on trade unions, issued in 1892, there were some figures obtained by a highly unstatistical method, which Mr. Wood had rightly criticised. But these criticisms did not apply to the whole of the figures, but only to those of a comparatively small number of unions, for which no monthly statistics of unemployed were available. The figures for such unions ought never to have been included in the report, and they only crept in by accident. In subsequent years the figures were only taken for those unions which published monthly figures. There was a certain difficulty in carrying back to 1860 the figures which Mr. Wood got by taking the number of members of the union at the end of the year, and the monthly number of unemployed, because some of the largest unions put the numbers engaged in disputes and numbers unemployed together. It would be a heavy task to weed out all those who were involved in disputes. He might also point out two reasons why the monthly figures obtained by Mr. Wood did not appear quite so large as those published in the *Labour Gazette*. On the one hand they probably included superannuated members in the total membership with which the numbers unemployed were compared, and on the other hand they took

no account of those who had been so long unemployed as to run out of benefit. On the whole, however, the two sets of figures agreed fairly well. He understood Mr. Wood to suggest that the wider the area of industry covered by the statistics the larger the proportion of unemployed would appear, and that if they could get the non-unionists included, the proportion would be still larger. His belief was that the published figures, though forming a very good index to the course of employment, tended if anything to exaggerate the absolute magnitude of the changes, being almost too sensitive a barometer. The trade unions which gave the number of unemployed, the only basis of the figures, had a very large part of their strength in the engineering and ship-building trades. Industries which were concerned with the making of machinery or the building of ships fluctuated perhaps more than any other, and, from the nature of the case, those industries were undoubtedly disproportionately represented. If they could include the whole area and bring in other large bodies like the railway servants and agricultural labourers, it would probably be found that the fluctuations of employment, although they would still be in the same direction, would be less sharp. Viewing the decennial averages, it was said that on the whole the proportion of unemployment had increased, and the periods 1860-69, 1870-79, and 1880-89 were referred to. But if the author were correct in suggesting that employment fluctuated in periods of seven years, he thought that septennial periods (or some multiple thereof) rather than decennial periods should be compared, so as to include equal numbers of good and bad years; if there be a regular wave motion, the period compared should be a multiple of the wave length. But he hardly thought there was sufficient evidence to prove that seven years was now the period. He thought it had been so for one or two cycles, but the present state of things looked as if the period were lengthening again.

Professor F. Y. EDGEWORTH said he should like to bear witness to both the theoretical and practical value of this paper. On the practical side it bore on the condition of the working classes, and on the theoretical side on the method of index-numbers. The two subjects were not so unconnected as might appear, because, as they knew from Mr. Bowley's investigations, the refined method of index-numbers was useful in investigating changes in the prosperity of the wage-earning class as a whole. The author seemed fully to have grasped that method. Again and again in the paper one read such statements as, "that any series of averages will show similar results." It was a most important remark that the mere index-number framed from wholesale prices seemed to exaggerate the increase in the prosperity of the working classes. Mr. Wood's main problem might be compared to that of the measurement of the volume of trade—a thing not easy to define. It was a rather mysterious, almost metaphysical, something whose growth had to be measured. Mr. Wood had handled the problem very skilfully.

One difficulty he had met with was that of choosing the

proper period for base. As he justly observed, a change of basis
was a change of weights. Though that was so, generally, with
the ordinary index-numbers formed by addition, it was not true
of the geometrical average. If one took the geometrical average
of a series of entities, such as the prices of different articles or the
relative consumption of different articles and combined them in that
way, it did not matter when one began, what year one took as basis.
For instance, the geometrical average of the fourth year would
have the same ratio to that of the third whether one took the first
or second year as base. This did not prove that the method was
the best. It was, however, worth considering. He had no doubt
that the property was of some importance with regard to the
index number of prices. But he hesitated to recommend it in the
particular case where there was a kind of propriety in summation,
where you had to consider the growth of a certain whole utility,
or whatever it should be called. The authority of Jevons might
be invoked in favour of the geometrical mean, though his reasons
were difficult to follow.

With respect to the agreement which Mr. Wood had obtained
between averages taken on different systems it was the less
surprising in so far as several of the systems of weights were not
only discrepant. He (the speaker) should like a little further
explanation of what the different systems employed were.

Mr. A. L. Bowley said he might reply first of all to Mr. Llewellyn
Smith's criticism of the table on p. 639, for the figures in which
he was responsible. He interpolated them after studying those in
the Appendix, which are the only comparative statements easily
accessible; and he told Mr. Wood at the time that since 1890 there
was no distinct sign of either rise or fall, and, as the table showed,
the percentage change was only 1. This fall was shown not only
in Scotch mining, but also in British agriculture. One of the im-
portant objects aimed at by Mr. Wood was to measure the change
of consumption without introducing the question of value at all.
His figures showed that the changes of consumption of different
commodities varied immensely, the most striking change being
that of cocoa, whereas some of the other commodities changed very
little indeed. If any obvious system of weighting had been at
hand by which cocoa, raisins, meat, and wheat could be added
together with any common denominator, the problem would have
been simple; but the only system which appeared at all obvious
was to measure them in money, and that introduced the very
quantity which it was desired to leave out of the question. Mr. Wood
had got round that apparently insuperable difficulty by trying a
large number of different systems of weighting; finding all gave
practically the same result, he felt that the original difficulty might
be ignored. This fact to some extent furnished the answer to
Professor Edgeworth's suggestion of a geometrical mean; he did
not think in this case it would make any difference to the re-
sulting percentage. He regretted that Mr. Wood had not called
attention more minutely to the very striking diagram he had given,
but simply contented himself by saying that it showed, as it most

clearly did, the interdependence of social phenomena. On more minute examination a great many minor points of great importance might come to light. He did not quite agree with one or two of the conclusions the author drew with regard to the close dependence of one of these lines on another. The two lines which seemed most nearly related were those of employment and the marriage-rate, to which latter he did not allude. If they followed the same principle and compared the consumption line with the others, they came to the rather striking conclusion that consumption appeared to have moved with wages from 1860 to soon after 1870, but after that to have left wages and moved with employment. There was not very much evidence as to whether wages or employment changed first, but what was on the diagram showed that employment improved before wages, and also fell off before wages were reduced. The three upper lines would undoubtedly throw light on the relation of wages to purchasing power. Since the nominal money wages and consumption followed each other so closely from 1880 onwards, except in 1892 to 1894, it appeared at first sight as if it were money wages that should be observed rather than real wages as measured by purchasing power, because as measured by the index-number of wholesale prices the purchasing power had increased very much faster than nominal wages; and this was not borne out by the consumption line. But it might be possible that the working classes had to some extent already got the amount they needed to spend on those prime necessities included in the curve, and that the surplus value of their wages was going to matters not included in this table. That suggestion must, however, be taken in conjunction with Mr. Wood's caution that the great increase in the consumption of certain things such as tea, coffee, cocoa, and raisins, when employment was good, showed that the wants of the working classes were not saturated. He thought the author had rather concealed the great interest and value of this diagram, by giving so much room to his careful description of the method by which the details had been calculated. He thought, however, they had now heard enough of his work to trust the accuracy of his calculation, and would be able to concentrate their attention on the table, which would certainly give rise in the future, if not immediately, to several interesting discussions.

Major P. G. Craigie said the Society were to be congratulated on having so very useful and interesting a contribution from one of its very youngest Fellows. It would furnish material for further investigation. He suggested that Mr. Wood might supplement his estimate of the home production and consumption of wool by a reference to their colleague Mr. Sauerbeck, who published annual estimates in the circular mentioned. Another source of information on this point was available in the very valuable tables published every winter in the *Bradford Observer*. With regard to the question of meat consumption, he was glad to have had some correspondence with Mr. Wood, but in explanation of a sharp apparent drop in the head rates shown on p. 652 of the paper

between 1892 and 1893, from 125 lb. to 114 lb., and the probable effect of the change on the total consumption shown in the diagram, he wished to give a reminder and a caution to Mr. Wood and any one who used the figures. He (the speaker) was in some degree responsible for them, and he would say that it was not statistically safe to use the estimates, without qualification, for single years, because although the formulæ by which the totals were calculated might be useful for giving a reliable average, they were subject to the very important qualification that in certain years there was not the same proportion of meat put into the market as the total of the stock enumerated would suggest. Take for instance 1893, where there was a great reduction in the number of animals at the time when the annual return was taken owing to the peculiar drought of that year. But this reduction was probably due to many animals being sold at an earlier period than they would otherwise have been, and at different weights from those reached in ordinary seasons. The farmer did not sell the same percentage of his herds and flocks every year. A great deal depended upon the prices and the markets and the seasons, so that anything less than a three- or five-year average led to the danger of erroneous estimates. In conclusion, he referred to the satisfaction which the officers of the Society felt at seeing younger Fellows coming forward to take part in these debates. It was with much grief they had heard almost immediately after the last meeting of the death of the Nestor of the Society, Sir Rawson W. Rawson. As one of their oldest officers, he thought he would not be out of order in referring to the sad loss the Society had sustained; and whilst they welcomed, as on that day, the co-operation of new Fellows, they could not but remember how much they owed to the work of their older Fellows, among whom no one had perhaps done so much for the Society as Sir Rawson Rawson. They all greatly deplored the loss, even at such a good old age, of one of the champions of statistics in this country.

Mr. E. L. HARTLEY said he had had to use very largely in recent years the paper by Mr. Bowley, and it always appeared to him that that paper, if he might venture to say so, did a great deal of harm by suggesting to the people who used it, some of whom used it in a very unintelligent and unfair manner, that the purchasing power of the wages of the working man had been increased in proportion to the great fall of wholesale prices. The latter had fallen some 40 per cent., but it was very fallacious to assume that the purchasing power of wages had increased in that proportion. He had seen in the country how the press took hold of this suggestion, which Mr. Bowley now doubtless saw to be erroneous. If Mr. Wood had done nothing else in this paper, he had exposed that fallacy, and he hoped the exposure would be noticed in, and driven home by, the press as the original error had been. His own interest in the paper was pretty much concentrated on the excellent diagram. But he did not quite understand what the diagram of consumption meant. He supposed it represented the yearly variations in the total amount of the

specified articles consumed by the total number of people resident in the United Kingdom. Then taking the top curve in the diagram, he supposed the wages were the amount of money remuneration received by people engaged in manual labour who were represented by trades unions, and who amounted to about eight per cent. of the total number so engaged. The line of consumption included, for instance, the amount consumed by professional people, but their remuneration was not included at all in the wages figure. It might be that great errors would come in from comparing too closely statistics based on so widely differing data. He had himself, from figures of some twelve or eighteen unions supplied to the Board of Trade, constructed curves such as Mr. Howell had suggested as a useful addition to Mr. Wood's diagram. He found as a matter of fact that those curves did show the fluctuations in exactly the same way as those shown by Mr. Wood. For instance, the minimum years in almost every case corresponded to the minimum years shown in the diagram of employment, and the maximum years also corresponded. From the study he had given to the subject he felt that he could place very great reliance on the results which Mr. Wood had given in this very valuable paper.

The CHAIRMAN (Sir FRANCIS S. POWELL, Bart., M.P.) said he felt bound to speak—and he spoke on behalf of every Member of the Society—in honour of the memory of Sir Rawson Rawson. He was a man who in his day did service of the most eminent kind to the public, and not least to that Society. But what impressed him as much as any other of his attractive qualities was the mode in which he brought forward young men, and made it a pleasure to them to associate with him in this Society. Few men had lived so long, and still fewer men had lived so well. He had no doubt that his memory would be long treasured in that Society. They would be grateful to him for the work he had done, and would feel that his example had left a legacy which they would do well to make their own.

He must congratulate Mr. Wood on the diagram which he had presented to the meeting. The use of diagrams in statistics was becoming more and more valued; but he did hope that those who illustrated their papers with diagrams would always bear in mind that diagrams could not supply that full and accurate information which figures, dry and dull as they might sometimes be, inevitably conveyed. They had the right to congratulate themselves on the improvement in the social condition of the people. There was a flood to day, but to-morrow came the ebb tide. Still, the ebb was always succeeded by the flood, and they observed in tracing the history of the country from century to century and from decade to decade, that the high tide was always succeeded by water of still higher level. This paper was deficient in some respects, simply because the materials themselves upon which it was constructed were deficient. The author could take into account none of those honourable trades which were not yet organised; still less could he refer to those hangers-on and camp followers, as it were, of the

army of labour who were always in our midst and comparatively seldom employed. If they could be brought to the test of enumeration and figures, he feared that the picture, bright as a whole, would be greatly obscured and rendered less encouraging. Representing the mining district of Wigan, he must confess he had felt some surprise on hearing the figures relating to the coal trade. The terrible strike of some years since in the south Lancashire district led to an agreement between employers and employed, and from that day there had been a steady growth of the wages of the mining population of Lancashire, until at the present time the wages received by the miner were higher than they had ever been in the history of the industry. They might be quite sure that a miner in the receipt of higher wages would certainly make an impression on the market value of commodities. Allusion had been made in the paper to the inflation of the year 1870 and succeeding years. It had made itself felt in the tables of statisticians, but was a period arising from exceptional causes, such as the occurrence of the Franco-German war, which would not be repeated in the present or the next generation. So long as those figures were quoted in statistical documents there would be a certain fallacy in comparisons, because one was comparing a totally exceptional and unprecedented condition with what might be regarded as a more ordinary condition of affairs. They were much indebted to Mr. Wood for this paper, and he hoped they might look upon him as one of Sir Rawson Rawson's pupils and followers, men who had begun well in early life, and who in later years would be able to look back upon a life of admirable work, and to having contributed years of patient industry and great ability to the solution of many of those difficult financial questions upon which so much of the prosperity of the country depended.

The Chairman then proposed a vote of thanks to Mr. Wood for his paper, which was carried unanimously.

Mr. G. H. Wood, in reply, said he could assure Mr. Howell that he had already asked for space in some future *Journal* to put in a table showing the fluctuation in the payments per head of trade unions on unemployed benefit, and also that, taking returns from every union he could find which went far enough back, it gave very nearly the same curve of maxima and minima for the same years. There was not a difference of more than three-fourths of one per cent. between the Board of Trade figures and his own, which was very surprising to him, because the methods employed were so greatly different. The reason he did not continue the research to the end was that he simply wanted to get a line to continue the Board of Trade returns, which he recognised were more accurate than his own. In reply to Mr. Llewellyn Smith's criticism, he did not believe that the net annual earnings in 1893 rose, nor did Mr. Bowley. What he did think was that there was a nominal increase of one per cent. in that year. If they examined the balance sheet giving the changes in wages and hours of labour for that year, they would find there was a net gain of

something like 12,000*l.* per week to the wage-earning classes' income. This was attributed in the introduction to that report to the Scotch coal strike. But the fall in earnings for the year, if the percentage unemployed was deducted, would more than counteract this increase.

With regard to the unemployed table, it was his misfortune and not his fault, that the iron trade was over represented. This was the reason why he put in the figures in the first table. He wanted to show that one got the same shaped curve, representing the maxima and minima in the same years, no matter what data were employed, provided they were fairly continuous. If he were to draw on the diagram a curve showing the first table of unemployment, it would be very similar to the other, save that it would be uniformly above it. He could not agree that the average of a long period should be the same period as that of the cycle. The ten-year average line was exactly similar to Mr. Sauerbeck's hand drawn line, which showed the variations of wholesale prices. If that were drawn on the diagram the course of unemployment tended to increase, but not very much. In reply to Professor Edgeworth, he said that the chief system of weights came from Mr. Charles Booth's Budget E in *Life and Labour of the People of London.* Another budget was given in 1860 for a similar class by Mr. Chadwick, and would be found in the Society's *Journal.* These two budgets were indicative of relative values attributed to the different articles by the wage-earning classes at the beginning and end of the period. Using those two weights he went right through and found very little difference. In the first system of weights he simply eliminated those commodities which appeared of secondary importance and took the seven most important, which gave a very similar result. He had used other methods also, some of the results being shown in the Appendix. He always found that the curve would be very similar, although the total net amounts of fluctuation might not. He was very glad to hear Major Craigie say that he could get the full figures for wool. Even if the wool figure were wrong the utmost error in any year in the unweighted line was $\frac{1}{15}$th of 3 per cent. The weight of the dip in 1893 was not by any means due to the dip in meat, but was also due to the dips in other commodities as shown in Table VIII. He hoped the paper would be found useful. Some of the problems they had to solve could only be done by intense application, and by many workers contributing a small share to a large whole.

MISCELLANEA.

CONTENTS:

I.—*Lord Farrer.*

Since the last issue of the *Journal* the Society has had to deplore the loss of two Fellows who have served it in the office of President.

Thomas Henry Farrer, who died on the 11th October, 1899, was born in London in the year 1819, his father following the legal profession in Lincoln's Inn Fields. Educated at Eton and Balliol College, Oxford, Mr. Farrer took a second class in *Literæ Humaniores* in 1840, and then proceeded to read for the Bar, to which he was called in 1844. That profession, however, he soon deserted for the Civil Service, accepting the post of Assistant Secretary in the Marine Department of the Board of Trade. Here it was that he first made his mark in the public service. In the year 1866 he was promoted to the position of Permanent Secretary to the Board, and there he remained till he retired in 1886. But though he then left office, he did not by any means quit the public service; for he was elected an Alderman of the London County Council in 1889, and Vice-Chairman in the following year, whilst he also for some time acted as the leader of the Progressive party in that assembly.

In 1883 a baronetcy was conferred upon him, and ten years later he was raised to the dignity of a peerage of the United Kingdom.

Of his connection with our Society it may be said that Mr. Farrer, as he was then, was elected a Fellow of the Statistical Society in the year 1878, being proposed by Mr. G. Shaw-Lefevre and seconded by Sir Robert Giffen. In 1883 he was elected to

the Council.   In 1894 he was appointed President, and delivered
an inaugural address on the subject of "The Relations between
Morals, Economics, and Statistics."   This will be found in the
fourth part of the fifty-seventh volume of the *Journal.*   He
remained in the Presidential Chair till 1896.   Lord Farrer was a
strong and uncompromising free trader, and was interested in the
operations of all societies whose work enabled him to give
expressions to his opinions on the subject of free trade.   He had
also strong views on the currency question, and viewed with
undisguised apprehension the tendency on the part of the Great
Powers towards an increase of armaments.

The last occasion upon which Lord Farrer interested himself
in the work of our Society was when Mr. George Martineau's
paper on the "Statistical Aspect of the Sugar Question" was
read before the Society.   The state of health of Lord Farrer
(like that of the author of the paper himself) prevented his
attendance at the meeting ; but he wrote at considerable length to
Mr. Martineau, strongly combating the suggestion that a counter-
vailing duty would not be antagonistic to the principles of Cobden
and his followers.

II.—*Sir Rawson W. Rawson.*

In Sir Rawson W. Rawson, K.C.M.G., C.B., the Society has
been deprived both of its senior Fellow and of one who has done
more than perhaps any one else towards placing it in its present
satisfactory position.   Although not an original Fellow of the
Society, Mr. Rawson joined it in the first year of its existence,
having been elected as far back as the 16th March, 1835, his pro-
poser being Mr. G. R. Porter, who was practically the founder of
the Statistical Department of the Board of Trade, and who was at
that time and for some six years previously Mr. Rawson's official
chief.   The year following his accession to the Society, Mr. Rawson
was elected to the Council, and subsequently became Honorary
Secretary.   Two years after his election he became Editor of the
Journal.   In 1842 his official connection with the Society was
interrupted by the public duties which took him away from
England.   But his interest in the Society never abated, as is
evidenced by the fact that since the year 1835 he has been a
constant donor to our Library.   After an absence of thirty-four
years abroad, he was re-elected a Member of the Council in 1876,
and remained of that body till the date of his death.   Five times
in the years between 1876 and 1884 he discharged the duties of
Vice-President.   In the years 1884-85 and 1885-86 he was Presi-
dent of the Society.   His second term of office in this capacity
covered the time when the Society celebrated its Jubilee, and the
volume published to commemorate that occasion is to some extent
a monument of his services.   Two years later the Society received
—largely owing to Sir Rawson's influence and exertions—its
Charter of Incorporation.

It is also worthy of note, in speaking of Sir Rawson Rawson's Presidency, that one of the results of the Jubilee meetings was the founding of the International Statistical Institute, of which Sir Rawson Rawson was the first President, continuing in that office, and taking an interest in its welfare, almost to the date of his death, though the state of his health precluded him from being present at the recent congress at Christiania.

When Editor of the *Journal* of this Society Sir Rawson Rawson was a frequent contributor to its pages of articles which were in many cases of a critical nature, it being at that time the custom to comment on parliamentary papers and other statistical documents much more fully than has recently been the practice.

During his earlier connection with the Society it may be observed that the subject of criminal statistics and the effect of education in reducing the crime of the country were matters in which he took deep interest, and to which he devoted much study. In more recent times, and during the period of his Presidency, we see that the long time during which he had served the State in distant countries had had the effect of drawing his attention towards colonial affairs. Thus his first Presidential address in the year 1884 dealt with the subject of British and foreign colonies. The Imperial view which he took of the condition of our colonial possessions is also noticeable in the last paper read by him before the Society. When Lord George Hamilton in 1894 addressed the Society on the subject of ocean highways, and dealt with the question of the dependence of this country for its supplies, both of food and of raw material, on the maintenance of our command of the sea, Sir Rawson Rawson contributed subsequently a valuable note on the same question of our seaborne commerce of the country in relation to the position of the British ports, as well as the countries of origin and destination, and the lines upon which our commerce travels when in home waters.

The subject of the inaugural address delivered by Sir Rawson Rawson on the occasion of his second Presidency dealt with International Statistics, more especially with reference to the branch connected with Vital Statistics. And it is worth observing here that he was in 1891 Chairman of the Society's Imperial Census Committee, whose report has but recently been republished and laid before Her Majesty's Government by the Council.

In our library Sir Rawson Rawson took much interest. He remained Chairman of the Library Committee down to the date of his death, and he constantly suggested such additions as his foreign correspondence showed him to be advisable, and these he frequently procured himself for the Society. As recently as May of the present year he presided at an executive committee, being also present at the reading of a paper before the Society in the same month, his appearance at that time affording no indication that the Society were so soon to be deprived of the ever ready assistance and much valued advice of which his colleagues on the Council had so continually availed themselves.

With regard to Sir Rawson Rawson's career in matters not

immediately connected with our Society, it may be recorded here that he was born in the year 1812, and was educated at Eton. He entered the Board of Trade at the age of seventeen in 1829, and in the following year was appointed private secretary to Mr. Poulett Thompson, Vice-President of the Board. In 1834 he was appointed private secretary to Mr. Alexander Baring, who succeeded Mr. Thompson. When Mr. Gladstone first took office in 1841, he succeeded to the position vacated by Mr. Baring, and for a year Mr. Rawson served under him as private secretary. In 1842 he was appointed civil secretary to the Governor-General of Canada by Lord Derby, and at that date Mr. Rawson's connection with the Board of Trade terminated. After two years he was appointed treasurer to the Mauritius, where he served for twelve years. Afterwards in the year 1854 he became colonial secretary at the Cape of Good Hope, where he attended the first session of the colonial parliament. His special services as financial minister and colonial secretary brought him the honour of a C.B. In 1864 the governorship of the Bahamas was conferred upon him, and he was subsequently promoted to the governorship of the Windward Islands. During his tenure of this office he received his K.C.M.G. He retired from the public service in 1875, and at once resumed his active connection with the work of the Royal Statistical Society, in which his name and labours will be long remembered.

III.—*The Census of* 1901.

The Preliminary Report of the Census (1901) Committee, appointed by the Council in April, has already appeared in the *Journal*.[1] The Committee in question has since been pursuing its labours, and on the 16th November, 1899, it presented the following Second Interim Report. This having been unanimously adopted by the Council, was by its direction forwarded to the President of the Local Government Board, to the Secretary of State for Scotland, and to the Chief Secretary for Ireland.

Census (1901) Committee.

Second Interim Report.

In their preliminary Report, presented to the Council in May, 1899, the Committee recommended the drafting of a letter to the authorities responsible for the taking of the Census, renewing and emphasising the recommendations in the report of the Committee for the Census of 1891, in favour of the early passage of a Census Act when a Census has to be taken, and also in favour of making arrangements at the time of the Census Act for a Quinquennial Census, embracing at least particulars as to sex and age, to be taken five years after the Decennial Census.

[1] See *ante,* p. 385.

These matters appeared so urgent, and the policy of the Statistical Society regarding them so well defined, that it was thought desirable to take action at once, a view in which the Council of the Society fully concurred. The Committee have reason to believe that as far as the introduction of a Census Act early in the next session is concerned, the policy of the Society is receiving consideration. In the present Report accordingly it is proposed to take up some further questions, chiefly those which are likely to arise in the preparation of a Census Act itself, and on which it may be desirable therefore that their recommendations should be in the hands of the Census authorities while the necessary Bills are being prepared.

Date of the Census.

1. The Committee recommend that the date of the Census of 1901 be the night of Sunday the 31st day of March, 1901, being one of the two Sundays nearest to the ten years' interval allowed for between two Censuses. It is likewise the Sunday before Easter-day, while the Sunday following would be Easter Sunday itself, and for that reason inconvenient, owing to the great displacement of population which takes place at the Easter holidays.

"Story" and "Tenement."

2. The Committee recommend that in the Census (England and Wales) Act the word "tenement" be substituted for the word "story" in Section 3, as being the more comprehensive term and more accurate. A "story" occupied separately by a householder would be a "tenement," but there may also be a "tenement" which is only part of a "story."

For a similar reason, in Section 5 the word "tenement" should be substituted for the word "story," and the word "tenements" for the word "stories." The effect would be that a householder's schedule would be left for each tenant of a separate tenement or holding, whether a "story" or not, the object which it is desired to arrive at.

Copying the Schedules.

3. The Committee recommend that in Section 6 the direction that the enumerator is to copy each householder's schedule into a book provided for that purpose, should be so modified as to give the Registrar-General a discretion to dispense with such copying. Such a direction appears to the Committee to lay down a rigid rule for dealing with the documents upon which the compilation of the Census must be based, and they are of opinion that it will be to the advantage of the administration if no rigid rule is laid down. It is a pure question of administration how the primary documents, when once brought into existence, are to be utilised; and a hard-and-fast direction apparently tends to needless expense and delay in compiling the results. Were the department left quite free, it might or might not order copying into a book, and it would be free to substitute the use of cards for after-compilation, which is general in foreign countries. At any rate nothing seems

to be gained in an Act of Parliament by meddling with details of statistical administration in a manner which is found quite unnecessary in other statistical work.

The adoption of this recommendation would involve a good many consequential amendments in the Act, as the payment of the enumerators and other officers according to the Act is made dependent on the verification of the books into which the schedules have been copied ; and the amount paid and mode of payment may both have to be adjusted if copying into books is not to be insisted upon. Possibly in some districts fewer enumerators may be able to do the work if such copying is not insisted upon. The alteration, however, is not to be judged by its possible economy in some cases. Verification and supervision of the enumerators' work would still be necessary, and this must be provided for in the Act in connection with the scale of payments for the officers employed. It would be out of place for the Committee, however, to suggest in detail what these consequential amendments should be, as they are obviously questions for the department and the Parliamentary draftsman, if once the recommendation to abandon the hard-and-fast direction to copy into a book is adopted.

The Committee understand that this recommendation is in accordance with the existing practice in Ireland.

Unoccupied Houses.

4. The Committee recommend an amendment in Section 7, with a view to obtaining an account of the number of "occupied" houses which are not "inhabited"—that is, in which no persons slept or abode on the Census night. The amendment, it is proposed, should take the form of an addition at the close of the clause after the words, "all other uninhabited houses," of words to the following effect : "distinguishing those that are occupied from those that are unoccupied."

The Section, as amended, would then run as follows : "Every enumerator shall also take account of the inhabited houses, and of the houses then building, and therefore uninhabited, and of all other uninhabited houses, distinguishing those that are occupied from those that are unoccupied within his division."

It appears to the Committee unnecessary to go into details as to this recommendation, as the necessity of distinguishing between uninhabited houses that are legally "occupied" and those that are not so "occupied" is obvious. The distinction, it is understood, will be especially useful in connection with the comparison of the numbers of houses as returned in the Census, with the numbers of houses on the rate books.

Uniformity of the Schedules in the three Kingdoms.

5. The above recommendations apply specifically to the Census Act for England, but the Committee wish it to be understood that they should be applied *mutatis mutandis* to the Census Acts for Scotland and Ireland, so as to have as much uniformity as possible throughout. For the same reason the Committee would recommend strongly that the schedules in the three kingdoms should be as

far as possible uniform, the responsible departments consulting together. The existence of different ministerial departments for taking and compiling the Census in each country is from this point of view to be regretted; but the good feeling and patriotism of the separate ministers should be specially appealed to in a matter like this, which involves no politics.

It should be understood, of course, that the recommendation of uniformity does not extend to the omission from the Census of one of the three countries of particulars which have long been obtained without objection, and which it may seem desirable to continue—such as the particulars as to religious profession in Ireland. The schedules may remain substantially uniform in all other respects, although one includes a subject not dealt with in the others.

The form which it would seem most desirable to follow for all the three kingdoms, appears to the Committee to be the schedule for England and Wales. The bulk of the population of the United Kingdom being in England and Wales, it is reasonable, when uniformity is introduced, that the forms now used for the majority should be followed as far as possible throughout.

British and Foreign Subjects.

6. The Committee recommend that in Col. 10 of the schedule the heading should read as follows: "If born in foreign parts, state if British subject, naturalised British subject, or foreign subject."

At present no specific statement as to the individual being a foreign subject is required, that depending apparently upon an inference from the statement as to his being a British subject or not, but an explicit declaration would no doubt conduce to accuracy.

The Schedule in Ireland.

7. The Committee recommend that as far as practicable the householder in Ireland should fill up the schedule himself, in accordance with the practice observed in England and Wales and in Scotland.

The Committee would have preferred postponing their observations on the above points relating to the Census Act and the schedules, until they had had an opportunity of considering the whole subject of the Census in connection with the tabulation and report by which the results to be obtained from the householders' schedules are finally focussed and placed before the public. But rather than delay, they believe it is the most useful course to submit to the Council at once, with a view to immediate communication to the Census authorities, if the Council approve, a few practical observations which may be taken notice of in the preparation of the Census Act and of the schedules themselves. This will not prevent a further consideration of the whole subject if other points occur to the Committee in reviewing the Census tables as finally published, but meanwhile it may help to secure that some

important points are not overlooked, whatever additional sugges-
tions may afterwards be made.

The Committee propose now to consider mainly subjects
connected with the tabulation of the Census and the report to be
made by the Census authorities, with any other matters bearing on
the subjects of their interim reports which may occur to them.
The results, it is hoped, will be embodied before long in a con-
cluding report.

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R. GIFFEN,

Chairman.

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IV.—*On Life-Tables: their Construction and Practical Application.*
By T. E. HAYWARD, M.B. (Lond.), F.R.C.S. (Eng.), *Medical
Officer of Health for Haydock, Lancashire.*

NOTE.—The greater portion of Mr. Hayward's paper on Life-
Tables was published in the issue of the *Journal* for September,
1899. The present contribution, which forms Section III of that
paper, had to be held over owing to considerations of space. It
will fit in at p. 480 of the present volume.—ED.

Section III.

*Details of the Experimental Work upon which the scheme of con-
structing an extended Life-Table propounded in Section I was
based.*

In working out and applying the modified short method which
has been described in Section II, the foundation figures of the
following Life-Tables were dealt with, both for males and for
females in each case. England and Wales, selected Healthy
Districts, Manchester City, Glasgow, and Brighton.

After I had arrived at what seemed to be some sort of uniform
law of approximation to the E_x values of the respective extended
Life-Tables at and after age 25, I was perplexed by finding that at
the earlier ages great discrepancies existed, and *in opposite direc-
tions*, in the different Life-Tables.

These are set down in the following table:—

*Differences of E_x Values obtained by the Modified Short Method from those
of the respective Extended Life-Tables.*

At Age.	England and Wales, 1881-90.		Selected Healthy Districts, 1881-90.		Manchester City, 1881-90.		Glasgow, 1881-90.		Brighton, 1881-90.	
	Males.	Fe-males.	Males.	Fe-males.	Males.	Fe-males.	Males.	Fe-males.	Males.	Fe-males.
0	−0·34	−0·51	−0·14	−0·22	+0·35	+0·49	−0·07	−0·18	−0·10	−0·10
5	−0·45	−0·65	−0·15	−0·26	+0·51	+0·69	−0·10	−0·26	−0·09	−0·10
10	−0 35	−0·45	−0·10	−0·18	+0·05	+0·06	−0·02	−0·06	−0·11	−0·11
15	−0·14	−0·15	−0·08	−0·16	−0·23	−0·21	−0·04	−0·05	−0·12	−0·12

In seeking to discover the reasons for these divergencies, I resorted to the expedient of plotting out the p_x curves from age 5 to age 25 from the series of values as given in the p_x columns of the respective Life-Tables, and showing them in their relations to the straight lines representing the mean values of p_x for the age-periods 5—10, 10—15, 15—25, arrived at by the short method.

These relations were found to vary considerably in different cases; extreme types are represented in the diagrams, figs. 3 and 4.

Fig. 3.

Fig. 4.

Here, then, was found an explanation of the puzzling differences. The E_x values worked out from p_x curves of these two types must necessarily differ widely.

I at first thought that the different types of curves must depend upon essential differences in the relations of the foundation figures of population and deaths, from which the respective Life-Tables had been worked out, and the idea occurred to me that it might be possible to obviate these differences by working out the p_x values from age 5 to age 9 inclusive by a direct calculation from the births and deaths similar to that which has been described as applied to the first five years of life.

I therefore tried the experiment of classifying the deaths for my own sanitary district through a period of twenty-two years for the separate ages 5—, 6—, 7—, 8—, and 9—.

The results, however, showed such hopeless irregularity as to render this method unworkable.

On further thinking over the matter, and noting that although the relations of the p_x curves to the straight lines representing the mean p_x values obtained by the short method varied so much, there was such a close resemblance between the curves of the male and female sections of each Life-Table, that it would have been possible to sort them out at once by mere inspection if they had been mixed up together unmarked, there appeared an *à priori* probability that the differences might be really due to different methods of calculation, and that similar methods applied to the data of all these Life-Tables should give curves similar in their relations to the straight lines of mean p_x values.

I proceeded then (1) to consider what the ideal curve of p_x should be between ages 5 and 25; and (2) next to experiment with different series of interpolations to discover which came nearest to the ideal. These experiments were all in the first instance made with the same data, viz., those for Manchester City (males).

If the mean values of p_x for the age-periods 5—10, 10—15, and 15—25, be worked out from any Life-Table foundation figures of population and deaths, and represented diagrammatically to scale, the result will be something like what is represented in fig. 5. (The straight lines being at this point solely considered.)

Fig. 5.

In some cases the line 15—25 may be below the level of the line 5—10.

Assuming for the present that the data are absolutely correct, both as to the ages of the living and of the dying at these age-periods, and that the mean values of p_x are to be replaced by a *continuous curve* by erecting successive ordinates proportional in length to the p_x values for each separate year, and joining the extremities of these ordinates by a series of straight lines, with the result of an approximation to a continuous curve, we may inquire what should be the relation of such a curve to the straight lines?

(1.) Seeing that from age 5—10 the mortality is *decreasing*, its values of p_x would be *increasing*, but with a *diminishing rate of increase*, and the mean height of the ordinates p_5 to p_9 should be *greater* than the height (above the abscissa) of the straight line 5—10. Not *much* greater, but certainly *somewhat* greater.

(2.) Seeing that at some point between age 10 and age 15 the mortality attains its minimum, the p_x curve would then attain its highest point and would then begin to gradually decrease. Therefore the mean height of the ordinates p_{10} to p_{14} should be probably about the same as the height above the abscissa of the line 10—15.

(3.) Finally, as after age 15 the mortality is increasing, the p_x values are *decreasing*, and *with an increasing rate of decrease*, therefore the mean height of the ordinates p_{15} to p_{24} should be somewhat *less* than the height above the abscissa of the line 15—25.

Now the curve fulfilling these conditions is one something like the dotted line in fig. 5.

With this ideal before me, I commenced to experiment by working out p_x values from p_5 to p_{14} by means of interpolations in various series of the logs. of the u_x values of $(P - \frac{1}{2}d)$ and $(P + \frac{1}{2}d)$.

The special formulæ required were worked out from Lagrange's general formula. Several points had to be considered—

(1.) Where to begin, whether to begin at u_5, or to take in u_3 and u_4, or u_4 alone.

(2.) Whether to include u_{10} or leave it out.

(3.) How far to go on the other side of u_{15}.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

The series of diagrams, figs. 6 to 14, will more clearly and quickly demonstrate the general nature of the results obtained than by columns of figures or verbal descriptions.

Series from which the respective Curves were obtained.

Fig. 6 .... u_3, u_4, u_5, u_{15}, u_{25}..................... 4 orders of difference.
 ,,   7 .... u_3, u_4, u_5, u_{10}, u_{15}, u_{25} 5   ,,
 ,,   8 .... u_4, u_5, u_{15}, u_{25} 3   ,,
 ,,   9 .... u_4, u_5, u_{15}, u_{25}, u_{35} 4   ,,
 ,, 10^2 .... u_4, u_5 u_{10}, u_{15}, u_{25}, u_{35} 5   ,,
 ,,   11 .... u_5, u_{10}, u_{15}, u_{25}, u_{35}, u_{45} 5   ,,
 ,,   12 .... u_5, u_{15}, u_{25}, u_{35}, u_{45} 4   ,,
 ,,   13 .... u_5 to u_{85} 8   ,,

An inspection of these diagrams will make it apparent that the curve in fig. 10, in so far as it goes, is the one to be chosen.   The next best is fig. 11.   The others are obviously absurd.

The following conclusions may also be gathered :—

(1.) That u_3 is a disturbing member, and must be *excluded*. (This applies to u_3 taken together with u_4. If u_3 be substituted for u_4, a rational curve is obtained, not very greatly differing from the one given by u_4, &c.)

(2.) That u_4 and u_{10} must be *included*.

(3.) That it is necessary to go as far as u_{35} in the series.

It will also appear that nearly all the possible combinations of series of u_x values have been worked out.

The series u_4, u_5, u_{10}, u_{15}, u_{25}, with four orders of differences, was also tried, but was found to give an irrational result in the curve from p_{15} to p_{24}.

Having now obtained the first half of the curve required, it remained to weld the series u_4, u_5, u_{10}, u_{15}, u_{25}, u_{35}, with a following one to obtain the values u_{16} to u_{24} required for the p_x values p_{15} to p_{24}.

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[2] Fig. 10 will also represent another series worked out with six orders of differences, viz., u_4, u_5, u_{10} u_{15}, u_{25}, u_{35}, u_{45}, as, except on a very large scale, no perceptible difference would appear.

For this at first the series u_5, u_{15}, u_{25}, u_{35}, u_{45}, with *four* orders of differences, was taken. Afterwards the series u_5 to u_{55}, with *five* orders of differences was adopted, but there is no material difference thus produced in so far as p_{15} to p_{24} are concerned.

Finally, having combined the series and worked out the p_x values, the complete curve shown in fig. 14 was obtained, and the ideal indicated in fig. 5 was *exactly realised*.

The impression, gathered from mere inspection, was confirmed by comparing the numerical values of the respective mean p_x values, which were found to exactly fulfil the conditions previously laid down. These are given in a succeeding table.

However the result desired had only been obtained in *one instance*, and there remained the crucial test of applying the same method of calculation to the foundation figures of other Life-Tables, to ascertain whether analogous results could be arrived at.

This test has been applied in four other instances, viz., England and Wales (males) and (females); Healthy Districts (males), and Brighton (males), and in each case a curve of p_x from age 5 to age 25 has been worked out by the method as already described for Manchester City (males).

These curves have come out so uniformly with regard to their relations to the mean p_x values for the age-periods 5—10, 10—15, and 15—25 as calculated by the short method that given these three foundation lines, it would be possible to approximately draw the p_x curve by a merely graphic process without calculation.[3]

Figs. 15 to 19.

In this series of diagrams, which have been drawn accurately to scale, the p_x curves, as worked out by the method described, are indicated in *full* lines, and are shown contrasted with the p_x curves of the respective published Life-Tables, which are set down in *dotted* lines.

Fig. 15.   Manchester City (Males).

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[3] Since the above was written, calculations have been made from the data of the Glasgow Life-Table (males and females), with exactly analogous results.

Fig. 16.   England and Wales (Males).

Fig. 17.   England and Wales (Females).

Fig. 18.   Selected Healthy Districts (Males).

Fig. 19.   Brighton (Males).

Attention may be directed—

(*a.*) To the curves as calculated by the method drawn to scale in figs. 15 to 19, and compared with the corresponding curves

plotted out from the respective published Life-Tables, these latter being represented as *dotted* lines.

(*b.*) To the numerical mean values of p_x for the three age-periods tabulated for comparison.

(*c.*) And finally, to the series of E_x values which have been worked out. In each case E_0, E_5, E_{10}, and E_{15}, have been calculated by means of the new p_x values from p_5 to p_{24}. Having worked out the l_x columns as far as l_{25}, it was a simple matter of proportion to calculate what values of Q_{25} should be taken corresponding to the new l_{25} value.

In the table of E_x values, the newly calculated ones of which are printed in thick type, comparison is also shown throughout with the corresponding values calculated by the modified short method previously described in Section II.

Table showing comparison of Mean Values of p_x for the Age-Periods
5—10, 10 —15, and 15—25.

MANCHESTER CITY. (*Males.*)

Age-Periods.	New Extended Method (*a*).	Differences of *a* from *b*.	Short Method (*b*).	Differences of *c* from *b*.	Published Life-Tables (*c*).
5—10	0·99247	+ 0·00006	0·99241	− 0·00208	0·99033
10—15	0·99630	± 0·00000	0·99630	− 0·00130	0·99500
15—25	0·99380	− 0·00004	0·99384	+ 0·00058	0·99442
ENGLAND AND WALES. (*Males.*)					
5—10	0·99470	+ 0·00003	0·99467	+ 0·00049	0·99516
10—15	0·99704	− 0·00001	0·99705	+ 0·00096	0·99801
15—25	0·99499	− 0·00005	0·99504	+ 0·00041	0·99545
ENGLAND AND WALES. (*Females.*)					
5—10	0·99479	+ 0·00004	0·99475	+ 0·00084	0·99559
10—15	0·99689	± 0·00000	0·99689	+ 0·00125	0·99814
15—25	0·99503	− 0·00001	0·99504	+ 0·00035	0·99539
SELECTED HEALTHY DISTRICTS. (*Males.*)					
5—10	0·99613	± 0·00000	0·99613	+ 0·00019	0·99632
10—15	0·99773	± 0·00000	0·99773	+ 0·00010	0·99783
15—25	0·99578	− 0·00010	0·99588	+ 0·00011	0·99599
BRIGHTON. (*Males.*)					
5—10	0·99521	+ 0·00001	0·99520	+ 0·00002	0·99522
10—15	0·99769	− 0·00001	0·99770	− 0·00001	0·99769
15—25	0·99539	− 0·00005	0·99544	± 0·00000	0·99544

Table showing E_x Values calculated by the modified Short Method (b) (as described in Section II), compared with the corresponding Values worked out by the Extended Method (a). (The Values of E_0, E_5, E_{10}, and E_{15}, have been recalculated by the proposed New Method; the remaining E_x Values are those of the respective published Life-Table.)

	England and Wales (Males).			England and Wales (Females).			Selected Healthy Districts (Males).		
	(a).	(b).	Differences of (b) from (a)	(a).	(b).	Differences of (b) from (a).	(a).	(b).	Differences of (b) from (a).
E_0	43·28	43·32	+ 0·04	46·66	46·67	+ 0·01	51·33	51·36	+ 0·03
E_5	52·24	52·30	+ 0·06	54·26	54·27	+ 0·01	56·88	56·92	+ 0·04
E_{10}	48·59	48·65	+ 0·06	50·64	50·65	+ 0·01	52·95	52·99	+ 0·04
E_{15}	44·28	44·33	+ 0·05	46·40	46·40	± 0·00	48·53	48·56	+ 0·03
E_{20} ...	40·27	40·28	+ 0·01	42·42	42·40	− 0·02	44·41	44·41	± 0·00
E_{25}	36·28	36·34	+ 0·06	38·50	38·51	+ 0·01	40·39	40·40	+ 0·01
E_{30}	32·52	32·53	+ 0·01	34·76	34·74	− 0·02	36·52	36·49	− 0·03
E_{35}	28·91	28·87	− 0·04	31·16	31·08	− 0·08	32·70	32·65	− 0·05
E_{40}	25·42	25·38	− 0·04	27·60	27·51	− 0·09	28·92	28·85	−'0·07
E_{45}	22·06	22·04	− 0·02	24·05	24·01	− 0·04	25·19	25·11	− 0·08
E_{50}	18·82	18·79	− 0·03	20·56	20·50	− 0·06	21·53	21·42	− 0·11
F_{55}	15·74	15·71	− 0·03	17·23	17·12	− 0·11	18·00	17·87	− 0·13
E_{60}	12·88	12·84	− 0·04	14·10	14·00	− 0·10	14·66	14·51	− 0·15
E_{65}	10·31	10·24	− 0·07	11·26	11·17	− 0·09	11·60	11·43	− 0·17
E_{70}	8·04	7·98	− 0·06	8·77	8·71	− 0·06	8·88	8·74	− 0·14
E_{75}	6·10	6·06	− 0·04	6·68	6·62	− 0·06	6·56	6·46	− 0·10
E_{80}	4·52	4·53	+ 0·01	5·00	4·98	− 0·02	4·70	4·69	− 0·01
E_{85}	3·29	3·32	+ 0·03	3·71	3·69	− 0·02	3·30	3·33	+ 0·03
E_{90}	2·37	2·40	+ 0·03	2·75	2·75	± 0·00	2·31	2·33	+ 0·02
F_{95}	1·72	1·72	± 0·00	2·05	1·97	− 0·08	1·62	1·64	+ 0·02

I would therefore venture to submit that sufficient evidence has been presented to at least render highly probable these propositions :—

(1.) That the method which has been described of calculating the values of p_5 to p_{24} in an extended Life-Table, will uniformly give a rational curve.

(2.) That the proposed modification of the "short" method will uniformly give a close approximation for quinquennial age-intervals to the E_x values which would be arrived at by the extended method.

The following table of differences may now be compared with the table given on the first page of this section :—

Differences of E_x Values obtained by the modified Short Method from those of the respective Extended Life-Tables when recalculated by a New Series of p_x Values (p_5 to p_{24}) worked out by the method described in Section I.

At Age.	England and Wales, 1881-90.		Selected Healthy Districts, 1881-90.		Manchester City, 1881-90.		Glasgow, 1881-90.		Brighton, 1881-90.	
	Males.	Fe-males.	Males.	Fe-males.	Males.	Fe-males.	Males.	Fe-males.	Males.	Fe-males.
0	+0·04	+0·01	+0·03	+0·03	+0·02	−0·02	−0·02	−0·03	−0·06	−0·09
5	+0·06	+0·01	+0·04	+0·02	+0·02	−0·01	−0·04	−0·05	−0·08	−0·08
10	+0·06	+0·01	+0·04	+0·02	+0·02	−0·02	−0·02	−0·02	−0·09	−0·09
15	+0·05	±0·00	+0·03	+0·01	+0 02	−0·02	−0·02	−0·02	−0·09	−0·10

The delay in publication of this portion of the paper has enabled me to do the calculations necessary for making this table complete.

It will be now evident that it is by no means a matter of indifference what system of interpolation is adopted to obtain the p_x values from p_5 to p_{24}, as from the same data it is possible to arrive at values of E_0 and E_5, differing from each other by as much as a whole year.

Up to this point it has been assumed that the data of population and deaths for the age-periods 5—10, 10—15, and 15—25, are absolutely correct.

It remains now to consider whether, and if so how far, the proposition (1) is invalidated by probable inaccuracies in the data.

To refer again to fig. 5. If the absolutely true facts could be ascertained, the height of the straight lines 5—10, and 10—15 above the implied underlying horizontal line, or " abscissa," might have to be altered, and the alterations might be in the same or in opposite directions, and the hypothetical true curve of p_x represented by the dotted line would have to be readjusted.

But with the most extreme variations probable this hypothetical true curve would be only a little above or a little below the one worked out from the actual data.

In any case, however, we can do no otherwise than use the data provided, and I would submit that the curve from p_5 to p_{14} worked out from the series u_4, u_5, u_{10}, u_{15}, u_{25}, u_{35} from the admittedly faulty data, *will come nearer to the true curve than one calculated from the absolutely correct data (could they be obtained) by any other of the methods tried could do.*

The question as to the precise extent and direction in which misstatement of age comes into play in any given age-period, as for example 5—10, is a very complicated one, the most likely errors being :—

(1.) Children *under* 5 may be *added* to this age-group.

(2.) Children under 10 may be taken from it and wrongly included in the next age-group, 10—15.

(3.) These errors may affect (*a*) population, and (*b*) deaths, together or separately, and if both are affected, it may not be in the same proportion.

It would occupy too much space to go into an adequate discussion of these points.

Probably the mortality for the age-period 5—10 is somewhat *overstated,* and that for the age-period 10—15 *understated.*

On the extent of Variation in p_x and E_x values produced by varying the numbers of Orders of Differences in interpolations, and on the considerations determining the choice of method.

These are matters which could only be worked out by experimental calculations.

The work done may be thus summarised :—

(1.) In addition to the Life-Table for Manchester City (males), with five orders of differences throughout as described in Section I, I have also worked out two other schemes :—

1. After the first series u_4, u_5, u_{10}, u_{15}, u_{25}, u_{35}, with five orders of differences, the remainder of the work of interpolation was done with series of four orders of differences, " welded " or combined according to the following scheme. The places of welding are indicated by under-lines and over-lines, the portion of a series which is underlined is welded with the over-lined portion of the following series.

Series 1 .... u_4, u_5, u_{10}, $\underline{u_{15}}$, $\underline{u_{25}}$, u_{35}.

,,   2 .... u_5, $\overline{u_{15}}$, $\underline{u_{25}}$, $\underline{u_{35}}$, u_{45}.

,,   3 .... u_{15}, u_{25}, $\overline{u_{35}}$, $\underline{u_{45}}$, u_{55}.

,,   4 .... u_{25}, u_{35}, $\overline{u_{45}}$, $\underline{u_{55}}$, u_{65}.

,,   5 .... u_{35}, u_{45}, $\overline{u_{55}}$, $\underline{u_{65}}$, u_{75}.

,,   6 .... u_{45}, u_{55}, u_{65}, $\overline{u_{75}}$, u_{85}.

The formulæ for working out the lines of differences δ, δ^2, δ^3, δ^4, are the same as those for five orders, but with Δ^5 and δ^5 eliminated.

2. The other scheme worked from is as follows :—

Series 1 (6 orders)........ u_4, u_5, u_{10}, u_{15}, $\underline{u_{25}}$, $\underline{u_{35}}$, u_{45}.

,,   2 (7   ,,   )........ $\overline{u_{15}}$, $\overline{u_{25}}$, u_{35}, u_{45}, u_{55}, u_{65}, u_{75}, u_{85}.

(2.) Portions of Life-Tables have also been worked out from the data for Manchester City (males), and for England and Wales (females) with eight orders of differences.

Variation of p_x Values.

Did space permit, it might be of interest to tabulate the whole series of p_x values obtained by four, five, and seven orders of differences side by side and differenced.

Practically it comes to this, that the series obtained by four orders of differences does not give quite as good a curve when plotted out and differenced as the series obtained by five orders, while there is not very much to choose between the latter and the series from seven orders.

Variation of E_x Values.

It would serve no useful purpose to completely tabulate the quinquennial series of E_x values obtained by the three methods. With an occasional difference of $\pm \cdot 01$ they are identical as far as E_{85}.

The comparison of E_{90} and E_{95} is given below :—

	Four Orders of Differences.	Five Orders of Differences.	Seven Orders of Differences.
E_{90}	2·52	2·51	2·50
E_{95}	1·89	1·88	1·85

The choice of the method with four orders of differences may therefore be made without any fear of obtaining less accurate results in so far as E_x values at 5-yearly age intervals is concerned.

I have chosen the scheme with five orders of differences chiefly because of the greater regularity and symmetry of the p_x curve obtained by it.

The idea of working with one continuous series with eight orders of differences from u_5 to u_{85} is theoretically good, but in some cases at least it is practically unworkable for these reasons:—

(*a*.) It has been shown previously that the p_x curve from p_5 to p_{14} obtained from this series is irrational.

(*b*.) If the nine u_x values of logs. of $(P - \frac{1}{2}d)$ and $(P + \frac{1}{2}d)$ from u_5 to u_{85} are set down and differenced, it is found in most cases that the values of $\Delta^8 u_5$, $\Delta^7 u_{15}$, $\Delta^6 u_{25}$ are $+$, while $\Delta^5 u_{35}$ is usually $-$.

The three $+$ differences when carried down to u_{95} and u_{105} are sometimes so large, for example in the case of England and Wales (females), as to swamp the $-$ values of $\Delta^5 u_{35}$, $\Delta^4 u_{45}$, $\Delta^3 u_{55}$, $\Delta^2 u_{65}$, and Δu_{75}, and the irrational result is obtained of an *increasing* series of p_x values. In other instances less extreme than this, the p_x values will not decrease fast enough, and the E_x values will be too great at the later ages.

For the last series of u_x values, therefore, being the one to be carried on beyond u_{85}, one cannot take a greater number of orders of differences than five, that is the series u_{35}, u_{45}, u_{55}, u_{65}, u_{75}, u_{85}.

Since having done the work described in a previous portion of this paper, I have found that a better p_x curve from p_{15} to p_{24} is to be obtained by interpolation effected in the series u_4, u_5 u_{10}, u_{15}, u_{25}, u_{35}, u_{45} (with six orders of differences), than that obtained by welding the series u_4 to u_{35} with the series u_4 to u_{55}.

For the method, therefore, described in Section I, one or other of the following two schemes may be substituted :—

(*a*) Series 1 .... u_4, u_5, u_{10}, u_{15}, u_{25}, u_{35}, u_{45}.

,, 2 .... u_{15}, u_{25}, u_{35}, u_{45}, u_{55}, u_{65}.

,, 3 .... u_{25}, u_{35}, u_{45}, u_{55}, u_{65}, u_{75}.

,, 4 .... u_{35}, u_{45}, u_{55}, u_{65}, u_{75}, u_{85}.

(*b*) Series 1 .... u_4, u_5, u_{10}, u_{15}, $\underline{u_{25}, u_{35}}$, u_{45}.

„   2 .... u_{15}, u_{25}, u_{35}, u_{45}, $\underline{u_{55}, u_{65}}$, u_{75}.

„   3 .... u_{35}, u_{45}, $\underline{u_{55}, u_{65}}$, u_{75}, u_{85}.

The latter scheme (*b*) may be considered to represent the largest number of orders of differences which it is desirable to use in the construction of a Life-Table, and on the whole it will entail rather less labour than the other schemes suggested, as although Series 1 and 2 with six orders of differences will give some extra trouble, there are fewer series to be worked out and fewer "weldings" to be effected. This is the scheme which I should on the whole prefer, but lest there should appear to be confusion, it must be borne in mind that so long as the *first* series is taken as u_4 to u_{35}, or u_4 to u_{45}, it does not much matter which of the suggested schemes is adopted for the remainder of the interpolations in so far as the ultimate E_x values are concerned.

Formulæ Required.

(1.) For the series u_4, u_5, u_{10}, u_{15}, u_{25}, u_{35}, u_{45}.

If u_4 be taken as u_0, then u_5, u_{10}, u_{15}, u_{25}, u_{35}, u_{45} will be respectively u_1, u_6, u_{11}, u_{21}, u_{31}, u_{41}, and the following formulæ will give the line of differences opposite u_0.

$$\delta^6 u_0 = + \frac{40}{97867} u_0 - 0.0006\,u_1 + \frac{164(+0.21824 u_6 - 0.1302 u_{11} + 0.0341 u_{21} - 0.00924 u_{31}) + 0.2046 u_{41}}{97867}$$

$$\delta^5 u_0 = - \frac{20}{7161} u_0 + 0.004 u_1 + \frac{124(-0.1232 u_6 + 0.063 u_{11} - 0.011 u_{21}) + 0.1848 u_{31}}{7161} - \frac{27.5}{3} \delta^6 u_0$$

$$\delta^4 u_0 = + \frac{4}{231} u_0 - 0.024 u_1 + \frac{2.464 u_6 - 1.008 u_{11} + 0.088 u_{21}}{231} - 5.8 \delta^5 u_0 - \frac{56}{3} \delta^6 u_0$$

$$\delta^3 u_0 = - \frac{1}{11} u_0 + 0.12 u_1 - 0.04 u_6 + \frac{0.12}{11} u_{11} - 3 \delta^4 u_0 - 4.8 \delta^5 u_0 - 5 \delta^6 u_0$$

$$\delta^2 u_0 = + \frac{4}{11} u_0 - 0.44 u_1 + 0.08 u_6 - \frac{0.04}{11} u_{11} - \delta^3 u_0 + 1.2 \delta^5 u_0 + 1.6 \delta^6 u_0$$

$$\delta u_0 = u_5 - u_4$$

In using these formulæ it is best to eliminate u_0 by subtracting it from all the terms of the series; u_0 is then reduced to zero, and all the terms containing it vanish. The *new* values of u_1, u_6, &c., must be then used in the formulæ, the differences remaining the same.

(2.) The values found may be checked by the following equation before proceeding with the interpolation :—

$$u_{11}(i.e., u_{15}) = u_0(i.e., u_4) + 11\delta u_0 + 55\delta^2 u_0 + 165\delta^3 u_0 + 330\delta^4 u_0 + 462\delta^5 u_0 + 462\delta^6 u_0.$$

The above formulæ, although sufficiently laborious to work from, will entail the expenditure of very much less time and trouble than the alternative method of calculating u_2, u_3, u_4, u_5, and then obtaining the differences by means of the consecutive series u_0, u_1, u_2, u_3, u_4, u_5, u_6.

As it is not proposed to practically use them, the formulæ of this method have been omitted.

Note.—In working out the successive u_x values in Series 1, it may be found that for part of the series the value of $u_{x+1} - u_{x+2}$ is greater than $u_x - u_{x+1}$. In spite, however, of this apparently irrational result, the p_x values work out all right.

(2.) For the series u_{15} to u_{75} (six orders of differences) the formulæ required are as follows :—

$$\delta^6 = \cdot 000001\Delta^6.$$
$$\delta^5 = \cdot 00001\Delta^5 - 22\cdot5\delta^6.$$
$$\delta^4 = \cdot 0001\Delta^4 - 18\delta^5 - 169\cdot5\delta^6.$$
$$\delta^3 = \cdot 001\Delta^3 - 13\cdot5\delta^4 - 96\cdot75\delta^5 - 478\cdot125\delta^6.$$
$$\delta^2 = \cdot 01\Delta^2 - 9\delta^3 - 44\cdot25\delta^4 - 150\delta^5 - 383\cdot4\delta^6.$$
$$\delta = \cdot 1\Delta - 4\cdot5\delta^2 - 12\delta^3 - 21\delta^4 - 25\cdot2\delta^5 - 21\delta^6.$$

The checking equation is—

$$u_{10} \ (i.e., \ u_{25}) = u_0 \ (i.e., \ u_{15}) + 10\delta u_0 + 45\delta^2 u_0 + 120\delta^3 u_0 + 210\delta^4 u_0 + 252\delta^5 u_0 + 210\delta^6 u_0.$$

NOTE.—In working out interpolations in series with six orders of differences, it is desirable to use seven or eight extra places of decimals. This will be made evident by the following equation :—

$$u_{31} = u_0 + 31\delta u_0 + 465\delta^2 u_0 + 4495\delta^3 u_0 + 31465\delta^4 u_0 + 169911\delta^5 u_0 + 736281\delta^6 u_0.$$

Remarks on the Scheme of Interpolation which has been adopted, viz.,
Combining the Population and Death Numbers, as $(P - \tfrac{1}{2}d)$ *and*
$(P + \tfrac{1}{2}d)$, *or* $(2P - d$ *and* $2P + d)$ *instead of Dealing with*
P *and* d *separately.*

The device of taking the logs. of the u_x values of $(P - \tfrac{1}{2}d)$ and $(P + \tfrac{1}{2}d)$ to work with instead of the corresponding u_x values of P and d separately, is one of the many ways in which Mr. A. C. Waters has invented improvements in Life-Table construction.

The most obvious advantage of this procedure is that the numerator and denominator of the p_x fractions are at once obtained all throughout.

It is a fair matter of inquiry, however—

(1.) Whether the results so obtained differ from those arrived at by taking population and deaths *separately.*

(2.) And if the results differ, which method is the more accurate ?

A little consideration will show that the results of the two methods must necessarily differ.

The simplest case of interpolation is, having given two numbers, to insert an intermediate value between them. This is simply effected by taking as this intermediate value half their sum, or their " arithmetical mean." It is a case of interpolation with " one order of differences." All interpolations applied to n *numbers* in a series with $n-1$ orders of differences are simply modifications of arithmetical progression.

On the other hand, when interpolations are applied to logarithms, it is the logarithms which are in arithmetical progression, and their equivalent numbers are in geometrical progression. All interpolations therefore applied to logarithms are instances of modified geometrical progression.

Thus given P_0 and P_{10}, to find P_5.
d_0 and d_{10} to find d_5.

By numbers (arithmetical progression) $P_5 = \dfrac{P_0 + P_{10}}{2}$ and

$$d_5 = \dfrac{d_0 + d_{10}}{2}$$

Therefore

$$\mathrm{P}_5 + \frac{d_5}{2} = \frac{\mathrm{P}_0 + \mathrm{P}_{10}}{2} + \tfrac{1}{2}\!\left(\frac{d_0 + d_{10}}{2}\right) = \frac{\mathrm{P}_0 + \dfrac{d_0}{2}}{2} + \frac{\mathrm{P}_{10} + \dfrac{d_{10}}{2}}{2},$$

This shows that when the *numbers* themselves are dealt with, the interpolations are exactly the same when population and deaths are combined or taken separately.

By logs. (geometrical progression) $\mathrm{P}_5 = \sqrt{\mathrm{P}_0 \cdot \mathrm{P}_{10}}$ and $d_5 = \sqrt{d_0 \cdot d_{10}}$, therefore making the interpolation in P and d *separately*.

$$\mathrm{P}_5 + \frac{d_5}{2} = \sqrt{\mathrm{P}_0 \cdot \mathrm{P}_{10}} + \frac{\sqrt{d_0 \cdot d_{10}}}{2};$$

whereas by making the interpolation in P and d combined, and calling the result $(\mathrm{P} + \tfrac{1}{2}d)_5$,

$$(\mathrm{P} + \tfrac{1}{2}d)_5 = \sqrt{\left(\mathrm{P}_0 + \frac{d_0}{2}\right) \cdot \left(\mathrm{P}_{10} + \frac{d_{10}}{2}\right)}.$$

On working out numerical instances, it will be found that the numbers resulting from the two methods of interpolation in logs. do not differ very much unless the differences between P_0 and P_{10} and d_0 and d_{10} are proportionately very great.

What actual differences would appear in the results of a Life-Table calculated by the two methods respectively could only be a matter of experiment to find out.

I therefore have thought it worth while to make some experiments in this direction. It seemed *a priori* that the differences of the p_x values worked out from the same data by the two methods would be most marked at the age-period 5—15, and after age 65.

The following table shows the comparison of the p_x values worked out for the age-period 5—15 by the two methods :—

Manchester City (Males). Series u_4, u_5, u_{10}, u_{15}, u_{25}, and u_{35}. (Five Orders of differences.)

	P and d combined (a).	P and d separate (b).	Difference of b from a.
p_5	0·98750	0·98752	+ 0·00002
p_6	0·99085	0·99084	− 0·00001
p_7	0·99325	0·99324	− 0·00001
p_8	0·99489	0·99488	− 0·00001
p_9	0·99591	0·99592	+ 0·00001
p_{10}	0·99642	0·99647	+ 0·00005
p_{11}	0·99660	0·99663	+ 0·00003
p_{12}	0·99648	0·99650	+ 0·00002
p_{13}	0·99618	0·99617	− 0·00001
p_{14}	0·99580	0·99579	− 0·00001

It thus appears that there is no appreciable difference between the results obtained for this age-period.

A comparative calculation was made for the age-period 45—55.

This also only showed such slight variations in the p_x curve as would not affect the E_x values.

A double series of calculations have been made from p_{65} to the end of the series, both for Manchester City (males) and for Brighton (males).

From age 65 to age 85 the two curves are found to vary some-what more, but as they alternately intersect each other, their mean values are practically the same.

The whole series of values are not given, to save space, but it may be of interest and advantage to show them from age 85 onwards, in series and differenced.

	P and d combined.				P and d separate.		

MANCHESTER CITY. (*Males.*) Five Orders of Differences.

	δ	δ_2	δ_3		δ	δ_2	δ_3
p_{85} .... ·76065	− ·01204	− ·00042	− ·00004	·76165	− ·01203	− ·00057	− ·00007
p_{86} .... ·74861	− ·01246	− ·00046	+ ·00003	·74962	− ·01260	− ·00064	− ·00007
p_{87} .... ·73615	− ·01292	− ·00043	− ·00002	·73702	− ·01324	− ·00071	− ·00006
p_{88} .... ·72323	− ·01335	− ·00045	+ ·00001	·72378	− ·01395	− ·00077	− ·00012
p_{89} .... ·70988	− ·01380	− ·00044	− ·00001	·70983	− ·01472	− ·00089	− ·00011
p_{90} .... ·69608	− ·01424	− ·00045	± ·00000	·69511	− ·01561	− ·00100	− ·00010
p_{91} .... ·68184	− ·01469	− ·00045	+ ·00002	·67950	− ·01661	− ·00110	− ·00016
p_{92} .... ·66715	− ·01514	− ·00043	± ·00000	·66289	− ·01771	− ·00126	− ·00016
p_{93} .... ·65201	− ·01557	− ·00043	+ ·00001	·64518	− ·01897	− ·00142	− ·00017
p_{94} .... ·63644	− ·01600	− ·00042	+ ·00003	·62621	− ·02039	− ·00159	− ·00021
p_{95} .... ·62044	− ·01642	− ·00040	+ ·00001	·60582	− ·02198	− ·00180	− ·00021
p_{96} .... ·60402	− ·01682	− ·00039	+ ·00002	·58384	− ·02378	− ·00201	− ·00026
p_{97} .... ·58720	− ·01721	− ·00037	....	·56006	− ·02579	− ·00227	....
p_{98} .... ·56999	− ·01758	....	....	·53427	− ·02806	....	....
p_{99} .... ·55241	....	....	....	·50621	....	....	....

BRIGHTON. (*Males.*) Five Orders of Differences.

	δ	δ_2	δ_3		δ	δ_2	δ_3
p_{85} .... ·79320	− ·01772	− ·00140	− ·00001	·80012	− ·01703	− ·00212	− ·00038
p_{86} .... ·77548	− ·01912	− ·00141	− ·00002	·78309	− ·01915	− ·00250	− ·00049
p_{87} .... ·75636	− ·02053	− ·00143	+ ·00002	·76394	− ·02165	− ·00299	− ·00055
p_{88} .... ·73583	− ·02196	− ·00141	+ ·00001	·74229	− ·02464	− ·00355	− ·00065
p_{89} .... ·71387	− ·02337	− ·00140	+ ·00006	·71765	− ·02819	− ·00420	− ·00081
p_{90} .... ·69050	− ·02477	− ·00134	+ ·00007	·68947	− ·03241	− ·00501	− ·00091
p_{91} .... ·66573	− ·02611	− ·00127	+ ·00009	·65706	− ·03742	− ·00592	− ·00103
p_{92} .... ·63962	− ·02738	− ·00118	+ ·00013	·61964	− ·04334	− ·00695	− ·00112
p_{93} .... ·61224	− ·02856	− ·00105	+ ·00012	·57630	− ·05029	− ·00807	− ·00116
p_{94} .... ·58368	− ·02961	− ·00093	+ ·00020	·52601	− ·05836	− ·00923	− ·00108
p_{95} .... ·55407	− ·03054	− ·00073	+ ·00016	·46765	− ·06759	− ·01031	− ·00079
p_{96} .... ·52353	− ·03127	− ·00057	+ ·00022	·40006	− ·07790	− ·01110	− ·00035
p_{97} .... ·49226	− ·03184	− ·00033	+ ·00021	·32216	− ·08900	− ·01145	....
p_{98} .... ·46042	− ·03217	− ·00012	....	·23316	− ·10045	....	....
p_{99} .... ·42825	− ·03229	....	....	·13271	....	....	....
p_{100} .... ·39596	....	....	....	....	....	....	....

When translated into E_x values the different results come out as follows :—

	Manchester City. (*Males.*)			Brighton. (*Males.*)		
	P and *d* combined (*a*).	P and *d* separate (*b*).	Differences of *b* from *a*.	P and *d* combined (*a*).	P and *d* separate (*b*).	Differences of *b* from *a*.
E_{65}	8·18	8·18	± 0·00	10·93	10·94	+ 0·01
E_{70}	6·50	6·50	± 0·00	8·62	8·58	− 0·04
E_{75}	5·15	5·15	± 0·00	6·58	6·58	± 0·00
E_{80}	4·06	4·07	+ 0·01	4·83	4·89	+ 0·06
E_{85}	3·20	3·21	+ 0·01	3·41	3·46	+ 0·05
E_{90}	2·51	2·47	− 0·04	2·34	2·23	− 0·11
E_{95}	1·88	1·79	− 0·09	1·59	1·22	− 0·37

It is thus apparent that the two methods give *practically identical results* until about age 85. After this the separate method gives the lesser E_x values, corresponding to the more rapidly decreasing p_x values which it is found to give.

Generally speaking the curve variations are more extreme in the separate method than the combined. In one instance in working out p_x values for the age-period 5—15, with P and *d separate*, I obtained the absurd result of getting p_7 and p_8 greater than unity. With P and *d combined*, the curve variation, although extreme, kept within rational limits. The *combined* method therefore *tends to moderate undue variation for anomalies in the data.*

On the whole, not only for the sake of convenience, but for the sake of what are probably more accurate results, it appears to me that the *combined* method is to be much preferred.

Comparison of the " Analytical" and " Graphic " Methods of Life-Table Construction.

The method of constructing an " extended " Life-Table which has been described in Section I of this paper, is one particular instance of the general mathematical process known as interpolation by the "method of finite differences." This is also otherwise termed the "analytical" method.

There is another process, however, which has been proposed for effecting the division of the population and death numbers of age-groups in such a way that the p_x values calculated from the subdivisions of the total numbers shall form an evenly graduated curve. This is known as the "graphic" method. Essentially this consists in representing by means of a series of parallelograms drawn to scale on one horizontal line, or abscissa which corresponds to the successive years of age, the total numbers of population or of deaths at the respective age-periods, and drawing a curved line through these parallelograms in succession, in such a way that the areas cut off and added to each parallelogram shall be exactly equal, and that the sum of the yearly ordinates shall exactly equal the area of the 5-yearly or 10-yearly parallelograms.

In the *Journal of the Institute of Actuaries*, No. cxxx, for October, 1883, Mr. George King, F.I.A., has written an able paper demonstrating that this was the method used by Milne in constructing his well-known Carlisle Life-Table. This method was adopted by Dr. Arthur Newsholme in the construction of his Life-Table for Brighton. It has also been used by Dr. Tattersall in working out his recently published Life-Table for Oldham. It is not my object to attempt any description of this method. The references above given will supply this.

It has appeared to me, however, a desirable thing to compare the results to be obtained by working out the two methods *from the same set of foundation figures.*

Now it is of course obvious that this might be done in one of two ways :—

(*a*) By applying the graphic method to the data from which an analytical life-table has already been worked out.

(*b*) Or by inverting this order.

For various reasons the latter course has seemed to me the best to adopt.

I have therefore to apologise to my friend Dr. Newsholme for having taken his foundation figures, and applied to them the method previously described.

The comparison may be made in two respects :—

(*a*) By comparing the p_x curves.

(*b*) By comparing the E_x values ultimately obtained.

If it were possible for me to publish appended to this paper the two curves as I have drawn them together on a large scale, all throughout, the remarks which I have to make would be very clearly demonstrated.

The first part of the curves has been shown in fig. 19.[4] From age 25 to age 65 the curve of the graphic method keeps fairly close to its companion, with occasional zigzag divergences, but after age 65 it becomes exceedingly irregular, whereas the analytical curve goes on to the end with a beautifully even symmetry.

The difficulties of the graphic method would appear to be :—

(*a*) The impossibility of measuring the ordinates of population and deaths on the scale usually employed with a sufficient degree of accuracy.

(*b*) The necessity of using the obviously erroneous data after age 85, and thereby arriving at impossible results.

When the E_x values come to be compared, except at the later ages, the graphic method gives a remarkably close approximation to the analytical, much closer than I had expected to find.

These values are compared in the table shortly to follow, which also shows for comparison the E_x values calculated by the modified short method.

It may also be noted that in applying the short method to the

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[4] When similarly plotted out, the p_x values from p_5 to p_{24} from Milne's "Carlisle Life Table," and from Dr. Tattersall's "Oldham Life Table" give very irregular and unsymmetrical curves.

data for Brighton, a somewhat closer approximation to the E_x
values of the extended (analytical) method would be obtained by
making the calculation for the age-period 75—85 in *two* stages
instead of *four*, as has been found most accurate in the other
instances tried.

To avoid confusion, however, the differences have only been
given in the table as applying to the method found best in all
other cases.

The choice of the two methods, analytical or graphic, must to
some extent be a matter of " personal equation."

To a very considerable extent the labour of constructing a
Life-Table is equal and the same whichever method be chosen.

In so far as I am concerned myself, I think I could work out
the interpolations required for the analytical method without
more expenditure of time than would be necessary to do the work
of experimentally drawing curves and measuring ordinates which
the, to me, untried graphic method would entail; to say nothing
about the special difficulties in adapting the graphic method to
the later part of the Life-Table.

Table showing comparison of E_x Values for Brighton (Males).

	Values in Dr. Newsholme's Life-Table (g).	New Values Calculated by Analytical Method (a).	Differences of (a) from (g).	Modified Short Method (b).	Differences of (b) from (a).
E_0	43·59	43·56	− 0·03	43·50	− 0·06
E_5	52·87	52·88	+ 0·01	52·80	− 0·08
E_{10}........	49·12	49·12	± 0·00	49·03	− 0·09
E_{15}........	44·67	44·66	− 0·01	44·57	− 0·09
E_{20}........	40·55	40·51	− 0·04	40·35	− 0·16
E_{25}........	36·51	36·51	± 0·00	36·34	− 0·17
E_{30}.......	32·67	32·68	+ 0·01	32·54	− 0·14
E_{35}........	29·02	29·04	+ 0·02	28·94	− 0·10
E_{40}........	25·60	25·57	− 0·03	25·51	− 0·06
E_{45}........	22·36	22·36	± 0·00	22·26	− 0·10
E_{50}........	19·33	19·36	+ 0·03	19·24	− 0·12
E_{55}........	16·48	16·46	− 0·02	16·36	− 0·10
E_{60}........	13·67	13·62	− 0·05	13·49	− 0·13
E_{65}........	10·96	10·93	− 0·03	10·82	− 0·11
E_{70}........	8·69	8·62	− 0·07	8·50	− 0·12
E_{75}........	6·64	6·58	− 0·06	6·49	− 0·09
E_{80}........	4·62	4·83	+ 0·21	4·79	− 0·04
E_{85}........	3·33	3·41	+ 0·08	3·40	− 0·01
E_{90}........	2·95	2·34	− 0·61	2·34	± 0·00
E_{95}........	1·68	1·59	− 0·09	1·63	+ 0·04

APPENDIX.

Note on a more Accurate Method of Calculating P_0, that is the Number Expressing the Mean Population for, or the Years of Life lived in, the First Year of Life.[5]

The method given in paragraph (*a*), $P_0 = l_0 -$ deaths 0—6 months, while expressing the number living at the middle of the year, will not accurately represent the years of life lived.

A better formula is $P_0 = l_1 + \dfrac{1}{6}$ deaths 0—6 months $+ \dfrac{5}{6}$ deaths 6—12 months. This has been worked out by Mr. A. C. Waters by means of the integral calculus, and is the method which he has adopted in the construction of the Life-Tables for England and Wales.

The method described in paragraph (*b*), based on the mean age at death of those dying under 1 year of age, may be approximated to thus :—

From Tables D and E, on pp. 14 and 15 of the Fifty-fourth Annual Report of the Registrar-General, I have worked out the following figures :—

Mean Age at Death.

	D.	E.	D and E combined.
	Months.	Months.	Months.
At 0— 3 months	0·83	1·10	1·00
,, 3— 6 ,, ...	4·38	4·43	4·42
,, 6—12 ,, ...	8·95	8·81	8·85

Therefore if d_0 be divided up proportionally, a sufficiently near approximation will be obtained by allowing one month to each of those dying at 0—3 months, $4\frac{1}{2}$ months to those dying at 3—6 months, and 9 months to those dying at 6—12 months.

Corrigenda in former portion of paper.

Page 461. 15th line from top—
   For $(P + \frac{1}{2}d)u_{15} = 1,673,281\cdot2$, *read* $= 1,728,871\ 0$.

Page 472. 15th line from top—
   Omit reduplicated figures 24 in log. p_{95}.

Page 477. 18th line from top—
   For an infinite number $= 86,511\cdot1$, *read* $= 86,561\cdot9$.

In next line—
$$For \ \frac{l_x - l_{x+10}}{\text{hyp. log. } \dfrac{l_x}{l_{x+10}}}, \ read \ \left(\frac{l_x - l_{x+10}}{\text{hyp. log. } \dfrac{l_x}{l_{x+10}}}\right) \times 10.$$

[5] This point was dealt with in the former portion of the paper, see *Journal* of the Royal Statistical Society, vol. lxii, p. 467.—ED.

V.—*On Geometrical Illustrations of the Theory of Rent.*
By PROFESSOR J. D. EVERETT, F.R.S.

IN the following paper, x will denote outlay, including interest reckoned up to the time of receiving the return; y the return upon x; z the profit accruing from the use of the land, that is, $y - x$.

Fig. 1.

Let PPP (fig. 1) be a portion of the curve whose coordinates are x and z. Then, if we draw through the origin O a line OK at an angle of 45° below the axis of x, and produce each ordinate PH downwards to meet OK in K, we have KP = KH + HP = OH + HP = $x + z = y$.

The "law of diminishing returns" is that $\dfrac{dy}{dx}$, and therefore also $\dfrac{dz}{dx}$ or $\dfrac{dy}{dx} - 1$ diminishes as x increases.

At the highest point of the curve, the tangent is horizontal, that is $\dfrac{dz}{dx}$ is zero. On each side of the highest point, $\dfrac{dz}{dx}$ departs continually further from zero as we move further, and the curve is concave downwards, as shown in the figure.

The cultivator endeavours to make z or HP a maximum. If he exactly attains this end $\dfrac{dz}{dx}$ is zero, and $\dfrac{dy}{dx}$ is unity, that is to say, a small increment (positive or negative) of the outlay x

involves an equal increment of the return y. This condition defines "the margin of profitable cultivation."

If the whole outlay x brought return at the same rate as this last small increment, the whole return would be equal to x, and the profit z over and above the interest on outlay would be zero. The actual profit z constitutes the commercial rent. In determining its amount, we are not concerned with any part of the curve except that which lies in the immediate neighbourhood of the point of maximum profit.

If we draw (as in fig. 2) the curve of which x and y are the coordinates (instead of x and z), $\dfrac{dy}{dx}$ will equal unity at the point of maximum profit, and the steepness of the curve at this point will be 45°, a small increment of x being accompanied by an equal

Fig. 2.

increment of y. To the left of this point the ascent will be steeper and to the right less steep than 45°, the difference from 45° becoming greater as we travel further from the point in either direction, so long as we keep within practical limits.

Drawing OL at an angle of 45° above the axis of x, we have—

$$\text{OH} = \text{HL} = x; \quad \text{HP} = y; \quad \text{LP} = \text{HP} - \text{HL} = y - x = z.$$

LP is obviously greatest when the tangent at P is parallel to OL.

Either of these two modes of representation illustrates very directly the reasoning employed in standard works in establishing the theory of rent. They seem to me to be the obvious and natural modes of expressing the facts geometrically. So obvious are they that it seems absurd to put them forward as novelties; but I can find nothing like them in the works of Marshall and

Jevons, who are the chief users of geometrical illustration, and I am inclined to think that they have not been previously published.

The method almost universally adopted (due, I believe, in the first instance, to Cournot) represents outlay by a length and return by an area; as if they were magnitudes differing in kind, so that one of them could not be greater than, equal to, or less than, the other. In this mode of representation (see fig. 3), if x and η are

Fig. 3.

the coordinates of the representative curve, the increment of return corresponding to the increment dx of outlay is the narrow vertical strip whose length is η, breadth dx, and area ηdx. In the practical part of the curve, η diminishes as x increases; and to exhibit the rent we must continue the curve as far as the point where ηdx is barely sufficient to remunerate the cultivator for the last increment of outlay dx. The whole return will be the sum of all the narrow strips ηdx; that is to say, it will be the area OABCD, or the integral of ηdx from $x = 0$ to the final value of x. The area of the rectangle ODCE then represents what would be a barely remunerative return on the whole outlay OD, and the difference of these two areas—that is, the area ABCE—represents the rent.

η in this mode of representation is my $\dfrac{dy}{dx}$, and the integral of ηdx is my y.

This favourite system of representation has the inconvenience of requiring the curve to be continued right back to the point of zero outlay. This is inconvenient—

(1.) Because the earlier part of the curve can scarcely be said to have any definite existence. It is altogether vague, depending on imaginary history.

(2.) Because the form of the early part has no bearing on the determination of rent for the later part. It is necessary to assign a definite magnitude of total area to the early part, but the shape of this area is immaterial.

(3.) Because the questionable character of the attempts which have been made to assign a shape to the early part has brought obloquy on the whole theory.

Either one of the two modes of representation which I am proposing puts in evidence all the considerations which tell upon the result, and no others.

Another defect in the usual plan is, that there is nothing in the curve to indicate which point in it is the limit of profitable cultivation.

I claim also that it is best to adopt a representation which recognises that outlay and return are magnitudes of the same kind.

Some writers regard outlay as expenditure of capital, others as expenditure of labour; while the return is usually regarded as consisting of wheat or some other species of produce.

But the limit of profitable expenditure, which is an essential conception in the argument, can only be defined by equating (in the case of the last small increment) the value of labour and materials expended, together with interest thereon, to the value of produce yielded. The attempt to regard the labour or capital expended as something which, on account of a difference in kind, cannot be equated to produce, thus breaks down in an essential point. It is better to accept openly the fact that outlay and return are directly comparable, and to let the diagram show this instead of masking it.

A word as to the way in which my diagrams will be modified by changes in prices.

If labour and all the other elements of outlay go up or down in the same ratio as the produce, the curves will be unchanged.

More generally, if the prices of the elements of outlay are altered as 1 to $1 + l$, and the prices of produce as 1 to $1 + p$, we may keep the x of every point unchanged, and multiply the y by $\dfrac{1 + p}{1 + l}$. If this multiplier is greater than unity, the x, y curve will be made steeper, and the point where the tangent slopes at 45° will be advanced further to the right, indicating a movement in the direction of higher farming. It is to be understood here that p and l are not restricted to be positive; one or both may be negative. If $\dfrac{1 + p}{1 + l}$ is less than unity, lower farming will be indicated.

I will conclude with an investigation which I believe is new, and which I hit upon in my first attempt to deduce a formula for rent from the principle of diminishing returns.

Compare two holdings of precisely similar land, one of them a little larger than the other—say 1 per cent. larger. Suppose the occupier of the smaller to expend upon it that outlay which gives maximum profit, and the occupier of the larger to expend only the same total amount, consequently an outlay per acre 1 per cent. less.

Let x and y denote the outlay and return per acre for the smaller holding. Then $x - \dfrac{x}{100}$ is the outlay per acre on the larger, and the return per acre which it brings will be—

$$y - \frac{dy}{dx}\frac{x}{100}.$$

This is only the return on an outlay $x - \dfrac{x}{100}$. The return on x will be 1 per cent. greater, that is, will be—

$$y + \frac{y}{100} - \frac{dy}{dx}\frac{x}{100},$$

neglecting quantities of the order $\dfrac{x}{10000}$.

The benefit arising from the extra $\dfrac{1}{100}$ of an acre over which the outlay x is spread is therefore—

$$\frac{y}{100} - \frac{dy}{dx}\frac{x}{100};$$

and the rent of 1 acre will be 100 times this, or—

$$y - x\frac{dy}{dx}.$$

But we are supposing the profit $y - x$ to be a maximum. This implies $\dfrac{dy}{dx} - 1 = 0$, or $\dfrac{dy}{dx} = 1$. Hence the rent per acre is $y - x$.

This result agrees with the orthodox rule, a fact which may be thought paradoxical, inasmuch as we have put the occupier of the larger holding under a restriction, instead of allowing him to expend as much money as he likes. The agreement is accounted for by the absence of profit in the last small increment of outlay, when outlay is carried to the limit of profitable cultivation.

The expression—

$$y - x\frac{dy}{dx}$$

above obtained for the rent, is identical in meaning with Jevons's formula—

$$Pl - l.P'l.$$

and with James Mill's statement (quoted by Jevons) :—

" Rent, therefore, is the difference between the return yielded to that portion of the capital which is employed upon the land with the least effect, and that which is yielded to all the other portions employed upon it with a greater effect."

By " the return yielded to that portion of the capital which is employed upon the land with the least effect," Mill means $x\dfrac{dy}{dx}$; no other interpretation will make sense. And by " that which is yielded to all the other portions employed upon it with a greater effect," he means y.

In dealing with intricate questions of quantity, the technical language of mathematics is immensely superior, both in precision and in simplicity, to ordinary non-mathematical phraseology, even when wielded by such a master as Mill.

VI.—*The Statistics of Wages in the United Kingdom during the last Hundred Years.* (Part V.) *Printers.* By A. L. Bowley, M.A., and George Hy. Wood.

The records of wages of compositors are more complete than those for any other industry except agriculture and the building trades. Trade union records for London extend back to 1770, for Manchester to 1821, and for Edinburgh to 1809. For Edinburgh we find, in the *Memorial unto the Master Printers of Edinburgh, by Journeymen Compositors,* 1804, an account of wages and earnings in Edinburgh in the years 1773, 1791, and 1802. The *Typographical Circular* and other publications of the Typographical Association give ample material for English towns since 1855, and the reports of the Scottish Typographical Association for Scotch towns since 1868; while for Ireland the report of the Select Committee on Workmen's Combinations of 1838 contains a list of wages current in several towns.

Other sources of information are :—

The *Typographical Circular.* (Monthly Journal of the Typographical Society.)

" Souvenir of the London Society of Compositors."

" Statistics of the Trade:" a sheet containing information as to wages in each town, prepared by the Typographical Society.

" The London Society of Compositors' Guide to Provincial Towns," containing similar information.

Other authorities are mentioned in the Bibliography of Wage Statistics,[6] *Economic Review,* 1898.

Printers' compositors are either permanently engaged and paid weekly wages, when they are said to be on the " 'stab," or are paid at piece rates.

The following table shows the changes of 'stab rates for book and jobbing work since 1770 :—

Table I.—*Compositors' Wages, expressed as Percentages of their Wages in* 1860.

	1773.	'77-85.	'86.	'91.	'92.	'93-94.	1801.	'02.	'03.	'05.	'09.	'10-16.
London	—	73	73	73	73	91	91	91	91	100	100	109
Manchester	—	66	75	75	75	75	83	83	83	83	83	106
Liverpool	—	—	—	—	—	—	—	—	—	—	—	—
Birmingham	—	—	—	—	—	—	—	—	—	—	—	—
Sheffield	—	—	—	—	—	—	—	—	—	—	—	—
Bath	—	—	—	—	—	—	—	—	—	—	—	—
Bristol	—	—	—	—	—	—	—	—	—	—	—	—
Hull	—	—	—	—	—	—	—	—	—	—	—	—
Worcester	—	—	—	—	—	—	—	—	—	—	—	—
York	—	—	—	—	—	—	—	—	—	—	—	—
Leeds	—	—	—	—	—	—	—	—	—	—	—	—
Newcastle	—	—	—	—	—	—	—	—	—	—	—	—
Durham	—	—	—	—	—	—	—	—	—	—	—	—
Cardiff	—	—	—	—	—	—	—	—	—	—	—	—
Newport	—	—	—	—	—	—	—	—	—	—	—	—

[6] By A. L. Bowley and Miss Hopkinson.

TABLE I *Contd.—Compositors' Wages, expressed as Percentages of their Wages in* 1860.

	1773.	'77-85.	'86.	'91.	'92.	'93-94.	1801.	'02.	'03.	'05.	'09.	'10-16.
Merthyr	—	—	—	—	—	—	—	—	—	—	—	—
Edinburgh	57	—	—	79	—	—	—	73	—	81	100	—
Glasgow	—	--	—	—	—	—	—	—	—	—	—	—
Aberdeen	—	—	—	—	—	—	—	—	—	—	—	--
Perth	—	—	—	—	—	—	—	—	—	—	—	—
Banff	—	—	—	—	—	—	—	—	—	—	—	—
Paisley	—	—	—	—	—	—	—	—	—	—	—	—
Dundee	—	—	—	—	—	—	—	—	—	—	—	—
Dublin	—	—	—	—	—	—	—	—	—	—	—	—
Belfast	—	—	—	—	—	—	—	—	—	—	—	—
Cork	—	—	—	—	—	—	—	—	—	—	—	—
Londonderry	—	—	—	—	—	—	—	—	—	—	—	—
Limerick	—	—	--	—	—	—	—	—	—	—	—	—
Weighted average 1860 = 100	—	73	75	75	75	90	90	90	90	95	100	106
Weighted average 1891 = 100	—	**60**	**62**	**62**	**62**	**74**	**74**	**74**	**74**	**79**	**83**	**88**

	1817.	'18.	'20.	'22-32.	'33-35.	'36.	'37.	'38.	'39-42.	'43-45.	'46-49.	'50.
London	106	103	100	100	100	100	100	100	100	100	100	100
Manchester	—	—	—	100	100	100	100	100	100	100	100	100
Liverpool	—	—	—	—	—	—	100	100	100	100	100	100
Birmingham	—	—	—	—	—	—	—	—	—	—	--	—
Sheffield	—	—	—	—	—	93	100	—	—	—	—	—
Bath	—	—	--	—	—	—	—	—	—	—	—	—
Bristol	—	—	—	—	—	—	—	—	—	—	—	—
Hull	—	—	—	—	—	—	—	—	—	—	—	—
Worcester	—	—	—	—	---	—	—	—	100	100	100	100
York	—	—	—	—	—	—	—	—	—	—	—	—
Leeds	—	—	—	—	—	—	—	—	—	—	—	—
Newcastle	—	—	—	—	—	—	—	—	—	—	—	—
Durham	—	—	—	—	—	—	—	—	—	—	—	—
Cardiff	—	—	—	—	—	—	---	—	—	—	—	—
Newport	—	—	—	—	—	—	—	—	—	—	—	—
Merthyr	—	—	—	—	—	—	—	—	—	—	—	—
Edinburgh	—	—	--	—	84	—	—	—	—	—	100	100
Glasgow	—	—	—	—	—	—	—	100	100	100	100	100
Aberdeen	—	—	—	—	—	—	—	—	—	100	100	100
Perth	—	—	—	—	—	—	—	—	—	--	—	—
Banff	—	—	—	—	—	—	—	—	—	—	—	—
Paisley	—	—	—	—	—	—	—	—	—	80	100	—
Dundee	—	—	—	—	76	76	76	76	95	95	95	95
Dublin	—	—	—	—	—	—	—	—	—	—	—	—
Belfast	—	—	—	—	—	—	100	84	—	—	—	—
Cork	—	—	—	—	—	—	87	87	—	—	—	—
Londonderry	—	—	—	—	100	100	100	100	—	—	—	—
Limerick	—	—	—	—	—	—	88	—	—	—	—	—
Weighted average 1860 = 100	103	97	94	94	94	98	98	98	100	100	100	100
Weighted average 1891 = 100	**85**	**80**	**78**	**78**	**78**	**81**	**81**	**81**	**83**	**83**	**83**	**83**

TABLE I *Contd.*—*Compositors' Wages, expressed as Percentages of their Wages in* 1860.

	1851-52.	'53-54.	'55.	'56.	'57.	'58.	'59-63.	'64.	'65-66.	'67.	'68-69.	'70.
London	100	100	100	100	100	100	100	100	100	109	109	109
Manchester	100	100	100	100	100	100	100	100	100	100	100	100
Liverpool	100	100	100	100	100	100	100	100	103	103	103	103
Birmingham	—	—	—	—	—	—	100	—	—	—	—	—
Sheffield	—	—	—	100	100	100	100	100	100	100	100	100
Bath	—	—	—	100	100	100	100	—	—	—	—	—
Bristol	—	—	—	100	100	100	100	100	100	100	100	100
Hull	—	—	100	100	—	—	100	100	100	112	112	112
Worcester	100	100	100	100	100	100	100	—	—	—	—	—
York	—	—	—	100	—	—	100	—	104	—	—	—
Leeds	—	—	—	—	—	—	100	100	100	100	100	107
Newcastle	—	—	—	100	112	112	100	100	100	112	117	—
Durham	—	—	—	100	100	100	100	—	—	—	—	—
Cardiff	—	—	—	100	—	—	100	100	114	128	128	128
Newport	—	—	—	100	—	—	100	—	—	—	—	—
Merthyr	—	—	—	100	114	100	100	—	—	—	--	—
Edinburgh	100	100	100	100	100	100	100	100	100	110	110	110
Glasgow	100	100	100	100	100	100	100	100	100	110	110	110
Aberdeen	100	100	100	100	100	100	100	—	—	—	115	115
Perth	—	—	—	—	—	—	100	—	—	—	110	—
Banff	—	—	—	—	—	—	100	—	—	—	—	—
Paisley	80	80	80	80	80	80	100	—	—	—	100	—
Dundee	95	100	100	100	100	100	100	105	105	105	105	114
Dublin	100	100	100	100	100	100	100	100	100	100	100	100
Belfast	—	—	—	100	100	100	100	—	—	—	—	—
Cork	—	—	100	100	100	100	100	—	—	—	—	—
Londonderry	—	—	—	100	100	100	100	—	—	—	—	—
Limerick	—	—	—	100	—	—	100	—	—	—	—	—
Weighted average 1860 = 100	100	100	100	100	100	100	100	100	100	102	102	103
Weighted average 1891 = 100	**83**	**83**	**83**	**83**	**83**	**83**	**83**	**83**	**83**	**84**	**84**	**85**

	1871.	'72.	'73.	'74.	'75.	'76.	'77.	'78-79.	'80-82.	'83.	'84-85.	'86-87.
London	109	109	109	109	109	109	109	109	109	109	109	109
Manchester	110	110	110	116	116	116	116	116	116	116	116	116
Liverpool	103	103	103	103	113	113	113	113	113	113	113	113
Birmingham	—	—	—	—	—	—	125	125	125	125	125	125
Sheffield	100	100	100	111	111	111	111	111	111	111	111	111
Bath	—	—	—	—	—	—	108	108	108	108	108	108
Bristol	104	104	104	104	104	112	112	112	112	112	112	112
Hull	112	112	112	112	112	117	117	117	117	117	117	125
Worcester	—	—	—	—	—	—	—	—	—	—	—	—
York	—	—	—	—	—	112	117	117	117	—	—	—
Leeds	107	107	107	107	107	—	—	—	—	--	—	114
Newcastle	—	—	--	—	—	—	—	—	—	—	—	—
Durham	96	96	104	104	104	113	113	—	113	113	113	113
Cardiff	128	128	128	138	138	138	138	138	138	138	138	138
Newport	—	—	—	100	100	100	100	100	100	100	100	100
Merthyr	—	—	—	105	119	—	—	—	—	—	—	—
Edinburgh	110	120	120	120	120	120	120	120	125	125	125	125
Glasgow	110	120	120	120	120	130	130	130	130	130	130	130

TABLE I *Contd.*—*Compositors' Wages, expressed as Percentages of their Wages in 1860.*

	1871.	'72.	'73.	'74.	'75.	'76.	'77.	'78-79.	'80-82.	'83.	'84-85.	'86-87.
Aberdeen	115	115	115	115	135	135	135	135	135	135	135	135
Perth	—	—	115	115	120	135	135	135	135	135	135	135
Banff	—	—	110	110	110	—	—	129	129	129	129	129
Paisley	—	—	110	120	120	120	120	120	130	130	130	130
Dundee	121	121	119	119	119	124	124	124	124	124	124	124
Dublin	100	110	110	110	110	110	110	110	110	110	110	110
Belfast	—	—	—	—	—	—	—	—	120	130	—	—
Cork	—	—	—	—	—	—	—	—	120	—	—	—
Londonderry	—	—	—·	—	—	—	129	—	—	—	—	—
Limerick	—	—	—	—	—	—	—	—	—	—	—	--
Weighted average 1860 = 100	106	107	107	113	114	115	116	116	116	116	116	116
Weighted average 1891 = 100	**88**	**88**	**88**	**93**	**94**	**95**	**96**	**96**	**96**	**96**	**96**	**96**

	1888-89.	'90.	'91-92.	'93-94.	'95-98.	'99.	Weights *a*.	'Stab Wages in 1898.	
								s.	*d.*
London	109	116	116	116	116	116	34	38	-
Manchester	116	116	116	116	116	116	8	35	-
Liverpool	113	113	113	118	118	118	8	35	6
Birmingham	125	137	137	137	137	137	8	33	-
Sheffield	111	111	118	118	118	118	3	33	-
Bath	108	112	112	112	112	112	1	28	-
Bristol	112	120	120	120	120	120	4	30	-
Hull	125	131	131	131	131	131	2	31	6
Worcester	121	121	121	121	125	125	1	30	-
York	—	—	—	121	121	129	1	29	--
Leeds	114	114	121	121	121	121	6	34	-
Newcastle	133	140	140	140	140	140	3	33	6
Durham	113	113	113	121	121	121	1	28	-
Cardiff	138	138	138	138	143	143	1	30	-
Newport	100	108	108	116	116	116	1	28	-
Merthyr	—	—	119	119	119	119	1	25	-
Edinburgh	125	125	125	130	130	130	3	32	6
Glasgow	130	130	136	136	136	136	3	34	-
Aberdeen	135	135	145	145	145	145	1	29	-
Perth	135	135	135	150	150	150	½	30	-
Banff	129	129	129	129	129	129	½	27	-
Paisley	130	130	136	136	136	136	½	34	-
Dundee	128	128	138	143	143	143	½	30	-
Dublin	110	116	116	116	116	116	2	35	-
Belfast	120	120	120	120	120	120	½	32	6
Cork	—	—	—	135	135	135	½	32	6
Londonderry	—	129	129	129	129	129	½	27	-
Limerick	135	135	135	145	145	145	½	29	-
Weighted average 1860 = 100	116	119	121	122	122	122	—	—	
Weighted average 1891 = 100	**96**	**98**	**100**	**101**	**101**	**101**	—	—	

Since the returns of the numbers in different districts are not complete, it is not obvious what system of weights should be adopted. As is so often the case, however, the differences between the average percentage increments found as the result of various schemes of weighting is less than the error due to other causes, which we have no means of measuring.

According to the census of 1891, the numbers of persons engaged in letterpress printing in that year were roughly as follows :—

England and Wales	82,000	Liverpool	2,000
Scotland	9,000	Manchester	2,000
Ireland	4,000	Edinburgh	2,500
London	34,000	Glasgow	2,500

The percentage increments are as follows :—

Wages in 1899 *as Percentages of those in* 1860.

		Weights *b*.	
London..	116	34	
15 other towns in England and Wales....	124	48	
7 towns in Scotland	134	9	
5 towns in Ireland	119	4	

If we give to each town in Table I the weight indicated by the census, the figure for 1899 is 120. If we take the weights *b*, and regard the wages in the selected provincial English towns as typical of English wages outside London, and the selected Scotch and Irish towns as typical for Scotland and Ireland, the figure is 122. Other systems adopted give 128 (when London is regarded as only of equal importance with all other towns), 125 (when Scotland as a whole is regarded as of equal importance with London), and other numbers from 120 to 130. Weights *b*, or in their expanded form, *a* (Table I), have been used. For calculating the average, numbers have been carefully interpolated on principles already explained. It seems very unlikely that more exact data would alter any of the resulting index-numbers since 1860 by more than 5, *i.e.*, 7 per cent. on the earlier, and 4 per cent. on the later numbers. It is to be noticed especially that these wages, which are not only those recognised by trade unions but in general those actually paid, have often remained unchanged for long sequences of years. In London they rose to 36*s.* during the wars at the beginning of the century, and only fell to 30*s.* by 1819. No change is recorded between that date and 1866. In many cases very little change is recorded even between 1865 and 1875.

Though the records are rather meagre, there seems good reason to hold that these rates of change are typical not only of 'stab wages, but also of piece earnings; and of wages in such kindred occupations as lithography and book-binding, especially since 1855 or 1860.

The following table contains the chief records of piece rates. The rate per 1,000 ens brevier is the standard whose change indicates closely those of other rates :—

TABLE II.—*Rate per 1,000 Ens Brevier (in Pence).*

	1774.	'85.	'93.	1801.	'03.	'05.	'10.	'15–16.	'25.	'29.	'39.
London	4	4½	—	5¼	5¼	5¼	6	6	6	6	6
Edinburgh	3	3½	—	3½	3½	4½	4½	4½	4½	4½	4½
Manchester	—	—	—	—	—	—	6	6	6	—	—
Glasgow	—	—	—	—	—	—	—	4½	4½	4½	4½
Dublin	—	—	—	—	—	—	—	—	—	5	5
Hull	—	—	—	—	—	—	—	—	—	—	—
Weighted average	51	58	—	64	64	70	76	76	76	76	76
Night 'stab—											
London	45	50	60	66	—	—	80	—	80	80	80
Provinces	—	—	—	—	—	—	—	—	—	—	80

	1861.	'66.	'67.	'71.	'72.	'77.	'80.	'84.	'86–89.	'92.	'93.
London	6½	6½	6½	6½	7	7	7	7	7	7½	7½
Edinburgh	4½	5	5½	5½	6	—	6½	—	—	6¾	6¾
Manchester	6	—	—	—	—	—	—	7	—	—	8
Glasgow	4½	—	5¾	6½	—	7	7	7	7	7½	7½
Dublin	5	—	—	—	—	—	—	—	6	6½	7
Hull	5	—	—	—	—	—	—	—	5½	6½	6½
Weighted average	76	83	84	85	90	91	92	92	92	100	100
Night 'stab—											
London	80	—	—	—	—	—	—	—	—	—	—
Provinces	80	—	—	88	—	90	—	97	98	100	100

The agreement between the index-numbers in Tables I and II is very striking.

Earnings on piece-rates fluctuate with the state of trade more than 'stab wages.

The following table, showing certain statements as to earnings in Edinburgh, throws some light on this relation; but the reliability and comparability of the figures leaves something to be desired :—

Earnings of Compositors. Edinburgh.

Year.	Earnings.		Authority.
	s. d.	*s. d.*	
1773	14 2	—	} Printer's Memorial and Accountant's Report, submitted to the Court of Session.
'91	19 8	—	
1802	18 5	—	
'03	17 11½	—	
'05	20 3	—	{ Webb : "Labour in the Longest Reign."
'42	14 –	—	} Webb : "Collection of Trade Union Documents." Bristol Library of Political Science.
'52	17 –	—	
'58	18 – to 21 –		
'61	17 3	—	

Wages differ according to the class of work. The most important divisions are those for book and jobbing work, weekly news, evening news, and morning news, the last being the highest. The following list indicates the relation between these rates :—

Manchester, 1885.[7]

		£	s.	d.	
Daily news offices. Per week of 53 hours		1	15	–	day work.
,, ,, ,,	51 ,, ...	2	2	–	night work.
Weekly news and jobbing ,,	55 ,, ...	1	15	–	
Casual labour per day		–	6	4	
Overtime per hour		–	–	10	

Piece Prices per Thousand Ens.

Daily Papers.	Morning.	Evening.	Weekly and Bi-weekly.
	d.	*d.*	*d.*
Minion and larger founts....	9	8½	8
Nonpareil	9¼	9	8½
Ruby	10	9¾	9½
Pearl	10½	10¼	10

The second part of Table II shows the general change for night 'stab, that is, of wages of regular men working on the morning papers. The list does not include London since 1860, for in London most men of this class work at piece rates. It will be seen that the course is much the same as in Table I.

The following table contains similar information as regards other branches of the book-trade :—

TABLE III.—PRINTERS' WAGES.—*Expressed as Percentages of their Wages in* 1891.

	1792.	1810.	'40.	'45.	'50.	'55.	'60–61.	'63.	'66–67.
Pressmen	37	80	80	80	80	80	80	82	86
Lithographic printers	—	—	—	—	78	78	80	80	—
Bookbinders	—	—	83	—	80	88	89	92	95

	1868.	'71.	'73.	'77.	'80.	'83.	'86.	'91.	'93–94.	'97–98.
Pressmen	86	86	95	102	102	99	100	100	103	104
Lithographic printers	—	—	—	104	104	96	98	100	101	102
Bookbinders	—	—	—	—	—	102	—	100	101	102

We have practically no information as to bookbinders or lithographic printers earlier than 1848, and it is not safe to assume that the index-numbers for earlier years are the same as those of compositors. In 1891, according to the census, for 7

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[7] From the Rules of the Society.

printers there were 1 bookbinder and 1 lithographer: we cannot therefore safely neglect the effect of any divergence of their wages on the averages, and it is therefore best to regard our index-numbers in Table I as relating to printing-houses only.

Other difficulties arise from changes in the structure of the industry. We have, for instance, no means of estimating the change from the comparatively low rate of wages paid to men on the 'stab, to the higher one paid for night news work. The whole trade has grown rapidly during recent years, but whether hands on morning news, daily evening news, or weekly news (who are usually paid at higher rates than the book and jobbing hands) have increased more quickly than these latter we have no means of telling. If they have done so, the average for recent years will be erroneous, because such a change involves an average increase of wages for the whole industry. The introduction of the linotype, again, for working which the wages are higher still, must necessarily have raised the average wage of the whole, though in what proportion it is impossible at present to tell. Further, the London Printing Trade Unions have largely increased their membership during recent years (since 1888 especially), and it is said that this increase in the number of organised workers involved a levelling up from the ranks of those who, not being under the rules of the trade societies, were content to work for less than the recognised minimum rate; but although we have complete records of the numbers of members in these unions, we have no means of knowing in what proportion their wages were below the minimum rate. The result exhibited in Table I would probably be influenced if we made allowance for these changes, but in our opinion the alteration would not be of importance, even for the figures since 1888, where the effect would be greatest. The earlier index-numbers (percentages of 1891) could not be greatly affected.

VII.—*The British and Continental Farmer: A Comparison.*
By R. H. HOOKER, M.A.

IN the paper read before the Society in November last, Mr. Crawford met the argument that the foreign system of farming succeeded more nearly than our own in supplying the wants of the population, by showing that we, on the whole, required a much smaller number of acres to produce a given quantity of cereals. He further pointed out, with reference to the counsel often given, that we should raise more corn by bringing pasture land under the plough, on the one hand that this was a question primarily of cost, and on the other that bread was not our only food. In taking part in the discussion on Mr. Crawford's paper, I endeavoured to meet this latter advice somewhat more directly, and to suggest the possibility that we might really be utilising the soil as well as the foreigner, in spite of devoting so much of it to grass. It seemed to me possible, moreover, that the greater density of

population, and especially of rural population, in Belgium, which is more particularly held up as an example to us, might be at least a partial cause of its relatively greater production : ought not two men to get more out of an acre than one ? It occurred to me, therefore, that some useful result might be secured by working in a direction hitherto apparently neglected, viz., by a calculation of the area cultivated and of the amount produced by each individual engaged in agriculture. It was obviously impossible at the time to do more than sketch in the very roughest manner the line I wished to pursue, and I have accordingly compiled at more leisure the accompanying tables, which it is hoped may prove a fairly trustworthy guide on this subject.

For the present purpose, in addition to the countries dealt with by Mr. Crawford, I have added the corresponding figures for England and Ireland (which, differing as they do so entirely from the United Kingdom as a whole, I thought interesting), as well as Holland. The latter appeared to present some interest, as the proportion of arable land to pasture is very similar to that which obtains in our own country.

The persons engaged in agriculture (whom I shall throughout this paper for brevity call " agriculturists ") are of course taken from the censuses of the country concerned, and the numbers given appear to me to be fairly comparable. In the case of the United Kingdom, for instance, the numbers are those in the " Agricultural Class," less those engaged in fishing ; except that for Ireland I have, following Sir R. Giffen,[8] assumed that three-fourths of the " General Labourers " over 20 years of age are engaged in agriculture, and added them to the total.

As regards the agricultural statistics, so far as concerns the United Kingdom and Holland they are taken from the Annual Agricultural Returns ; the other foreign figures are taken as far as possible from the special inquiries made during the present decade.[9] For the United Kingdom and Holland I have taken the year 1894. The selection of the particular year is a matter of some nicety. It would, theoretically, have been preferable to take an average of about five years. But as the annual returns of France, Germany, and Belgium are not full enough to admit of a sufficiently complete comparison for the present purpose, I have been obliged in these cases to use the special inquiries relating to a single year, and there is therefore no greater error in using a single year for our own country. It is, of course, desirable to select a year as equally distant as possible from the population statistics, and the most recent British returns were therefore, I considered, barred. I had at first thought of 1893 for our own country, the distribution of area being of fairly average character for the period, but the harvest of that year was so much under the average that it would have represented British production in far too unfavourable a light. Whilst 1894 has rather a larger proportion of arable land, though

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[8] General Report on Wages, &c. C–6889.

[9] France, 1892 ; Germany, 1893 ; Belgium, 1895. The population statistics for Germany relate to 1895.

still a good deal below 1891 (the census year), yet its harvest was on the whole rather above the mean. But these facts are counterbalanced, in my view, by the probability that our agricultural population shows more change—and that a decline—between 1891 and 1894 than the more stable population of the continent; and the area and quantity of each kind of produce per individual are probably more nearly represented by 1894 than by any other year at this period. It only remains to be said upon this point that the French harvest of 1892 appears also to have been over average, as does the German of 1893; the Belgian of 1895 was probably average, or a little over, and the Dutch of 1894 average or a little under.

Inasmuch as the aim of this paper is to estimate the yield per agriculturist, and not the consumption, I have not invariably adopted Mr. Crawford's figures. In the first place, those I give for the production relate to a single year (the same as for the area), and in the second, I have made no deduction for seed. Otherwise, I have followed his classification of area and production as far as possible, and for the meaning of the terms I must refer to his paper. Roots I have taken to include mangolds, turnips, swedes, and sugar-beet only; carrots, parsnips, cabbages, and the like being omitted. The particulars for England, Ireland, and Holland are, of course, calculated in a precisely similar manner. As regards additional matter, I have added the figures for rye (separately), hay, pasture, and rough grazings, together with the number of cattle, sheep, and swine. The animals should not, strictly speaking, be considered as additional produce of the soil, inasmuch as they consist first of produce from the soil already enumerated, and secondly of imported feeding stuffs: they may, however, perhaps be said to represent a certain amount of additional labour expended in the care of them. Swine are very commonly kept by persons other than farmers, and have accordingly still less right to be reckoned in the present inquiry.

A comparison of the areas under grass presents some difficulties, owing to differences in the classification adopted by different governments. The question is far too complex to enter upon here, and I must ask readers to accept my assurance that I have lately been at some pains to examine this subject, and that the areas here set down as equivalent are, to the best of my belief, reasonably comparable. A comparison of the yield of hay presents still more obstacles. Belgium gives only the total production from "grass for hay, *pasture*, and orchards," so that this evidently includes some kind of estimate of the quantity grazed. France gives a separate estimate of the yield of pastures, which works out to 15 cwts. per acre, this being presumably the hay equivalent of the grass eaten off. No clue is given as to what data this figure may rest upon. The amount certainly does not seem too high (the average production from the grass actually cut works out in France to about 22 cwts. per acre in 1892); but I have, nevertheless, adopted it, and applied it to the other countries concerned, except for Ireland, where the "pasture" may possibly include land corresponding to our mountain and heath land used for grazing

Miscellanea.

TABLE I.—*Area under different Crops (Thousands of Acres).*

Country.	Total Area.	Crops and Grass.	Arable.	Corn and Pulse.	Wheat.	Rye.	Potatoes.	Roots.	Vines.	Hay.	Grass not for Hay.	Rough Grazings.
England	32,544	24,818	11,690	6,122	1,827	81	341	1,745	—	5,738	9,995	1,986
Ireland	20,706	15,162	4,080	1,484	49	12	717	363	—	2,189	10,205*	—*
United Kingdom	77,671	47,851	20,273	9,366	1,980	103	1,232	2,682	—	9,184	24,257	12,467
Belgium	7,276	4,459	3,477	2,065	529	700	456	257	0·2	1,002	408	418
France	130,557	83,449	63,655	37,400	17,701	3,867	3,641	2,186	4,447	17,562†	4,472†	9,629
Germany	133,500	80,442	63,653	36,954	5,098	14,862	7,502	2,216	327	20,068	4,838	5,247
Holland	8,040	4,992	2,129	1,346	160	514	371	149	—	3,005		—

* Rough grazings in Ireland are possibly included with pasture.

† Assumes that all clover and rotation grasses are for hay.

Number of Agriculturists and Area per Agriculturist (Acres).

Country.	Agriculturists.	Crops and Grass.	Arable.	Corn and Pulse.	Wheat.	Rye.	Potatoes.	Roots.	Vines.	Hay.	Grass not for Hay.	Rough Grazings.
England	1,223,212	20·3	9·6	5·0	1·5	0·07	0·3	1·6	—	4·7	8·2	1·6
Ireland	1,007,283	15·3	4·1	1·5	0·05	0·01	0·7	0·4	—	2·2	11·3	—
United Kingdom	2,538,988	18·6	8·0	3·7	0·8	0·04	0·5	1·1	—	3·6	9·6	4·9
Belgium	649,252	6·9	5·4	3·2	0·8	1·1	0·7	0·4	—	1·4	0·6	0·6
France	6,535,599	12·6	9·7	5·7	2·7	0·6	0·6	0·3	0·7	2·7	0·7	1·5
Germany	8,267,971	9·7	7·7	4·5	0·7	1·8	0·9	0·3	0·04	2·4	0·5	0·6
Holland	524,624	9·5	4·1	2·6	0·3	1·0	0·7	0·3	—	5·7		—

TABLE II.—*Production of Crops and Live Stock (in Thousands).*

Country.	Corn and Pulse.	Wheat.	Rye.	Potatoes.	Roots.	Hay.	Hay from Pasture.	Cattle.	Sheep.	Swine.
	Bshls.	Bshls.	Bshls.	Tons.	Tons.	Tons.	Tons.	No.	No.	No.
England	220,809	56,088	2,436*	1,975	25,327	8,645	7,500*	4,451	15,910	2,014
Ireland	63,717	1,532	357*	1,873	5,038	5,309	5,100*	4,392	4,105	1,389
United Kingdom ...	346,675	60,704	3,080*	4,662	37,988	15,699	15,650*	10,781	30,088	3,794
Belgium	65,200	14,559	18,551	2,633	6,191†	4,846		1,421	236	1,163
France.................	751,231	322,122	66,943	15,948	20,390†	20,800	3,485	13,709	21,116	7,421
Germany...............	699,116	125,551	274,045	31,632	19,990†	14,955	3,630*	17,556	13,590	12,174
Holland	39,138	4,054	11,938	1,268	—	—	—	1,508	665	640

* Estimated.　　† Includes catch crops.

Production and Live Stock per Agriculturist.

Country.	Corn and Pulse.	Wheat.	Rye.	Potatoes.	Roots.	Hay.	Hay from Pasture.	Cattle.	Sheep.	Swine.
	Bshls.	Bshls.	Bshls.	Tons.	Tons.	Tons.	Tons.	No.	No.	No.
England	180·5	45·8	2·0	1·6	20·7	7·1	6·1	3·6	13·0	1·6
Ireland	63·3	1·5	0·4	1·9	5·0	5·3	5·1	4·4	4·1	1·4
United Kingdom ...	136·5	23·5	1·2	1·8	15·0	6·2	6·2	4·3	11·8	1·5
Belgium	100·4	22·4	28·6	4·1	9·5	7·5		2·2	0·4	1·8
France.................	114·9	49·3	10·2	2·4	3·1	3·2	0·5	2·1	3·2	1·1
Germany...............	84·6	15·2	33·1	3·8	2·4	1·8	0·4	2·1	1·6	1·4
Holland	74·6	7·7	22·8	2·4	—	—	—	2·9	1·3	1·2

(which I term "rough grazings" in this paper). In view of this risk I have accordingly reduced the estimate for Irish pasture to 10 cwts. per acre, so as to be upon the safe side. Although this figure of 15 cwts. is doubtless far from accurate, yet in our own case it almost certainly errs on the side of lowness, and we may accordingly be sure that the British production is not exaggerated. In spite of the untrustworthiness of the figures for grass, I have been anxious to include them, because we thus have in the tables the main items raised by farmers as food for man and beast—the chief exceptions being carrots, hops, cabbages, lucerne, and the like (though these are in the arable area), as well as fruit and market-garden produce. I have added the area of rough grazings, because they in certain districts are a material factor in the capacity of land to carry stock. No indication whatever can be given of their yield, more especially as the term is a very vague one, to which a different meaning is quite probably attached in different countries.

As regards roots, I have in the foreign countries included the produce of second or catch crops, but not the area so utilised (except for France, where it cannot be subtracted, and Holland). We have no particulars concerning catch crops in this country. Indeed, the cultivation of roots as a second crop appears to be a more common practice on the continent than with us. It should be stated that complete details of the production of roots in Holland are not available; and that the production of hay cannot be easily ascertained.

The first point revealed by Table I is that the area utilised by each agriculturist is very much larger in this country than on the continent. To this large total area per individual must be ascribed the somewhat unexpected fact that, in spite of having much more land permanently under grass, each English agriculturist has just as much land under arable culture as his nearest continental neighbour (nearly 10 acres). The other countries are left behind, especially Holland and Belgium. It is, of course, well known that our farms are on the average much larger, but it seemed possible that this was due more to the English system of cultivating many acres with the assistance of several hired labourers, as compared with the foreign method whereby the owner far more frequently cultivates his own plot of land with little extraneous aid. But it appears from these tables that each individual working on the farm in England—whether farmer or labourer, man or woman, boy or girl—cultivates, in the stricter sense of the term, as much land as the Frenchman, considerably more than the German or Belgian, and over twice times as much as the Dutchman.

As regards the area under corn and pulse, we are beaten only by the Frenchman; the same applies in the case of wheat, but here the difference is much greater, the Frenchman cultivating nearly twice as much as we do. The area per worker under wheat in Belgium, it may be noted, is just the same as in the United Kingdom as a whole, in spite of this cereal being almost ignored in Ireland. In the somewhat coarser bread-stuff rye—a staple

food abroad—we are, of course, left far behind; the greatest area per agriculturist being, as might be expected, in Germany. Taking wheat and rye together, it may be noted that Belgium and Germany, as well as France, are both ahead of us.

In the culture of potatoes we are well behind the continent, and even Ireland surpasses only France. This tuber, it must be remembered, is utilised much more in the manufacture of spirit and in other industries abroad than here. On the other hand, the area each agriculturist devotes to roots far exceeds in England that on the continent, amounting to four times as much as in Belgium, and five times as much as in France, Germany, or Holland.

Still more disproportionate, as was only to be expected, is the acreage under grass, not indeed so much that for hay (rotation and permanent), which is from two to three times the foreign, as the area grazed, which is twelve to sixteen times as large. For Holland no statement is given as to what proportion is intended for hay; the total area under grass in that country is 5·7 acres per agriculturist, as compared with our 12·9.

From this table of acreages it may then be observed, in connection with the anxiety sometimes expressed that more land should be brought under the plough, that for every person engaged in farming operations there is as much, or more, land under the plough in England as in the countries specially held up for our emulation, and that France is the only country with more land under cereals. In addition therefore to giving as much attention to this branch of agriculture, and not in lieu of it, each agriculturist devotes a great deal more to the raising of stock. The results of our respective labours on the land appear from Table II, which gives the chief items of production per agriculturist. The various government returns show that England raises more per acre of most articles of agricultural produce than any other country, and we shall accordingly expect to find any pre-eminence noted in the areas accentuated in the produce.

The first column shows that each English agriculturist produces far more corn than the foreigner: from 60 to 80 per cent. more than the Frenchman or Belgian, and more than twice as much as the German or Dutchman. Of all these, the nearest to approach us is France, with a corn area, if anything, slightly above our own; and even she falls short of England by 60—70 bushels of corn per worker, and short of the United Kingdom by some 20 bushels.

Of wheat alone, France produces about 5 bushels per cultivator more than we do, no other country coming near us. But France is, as is well known, essentially a great wheat producing country, and her production of most other things is relatively small. In a comparison of the bread-corn raised by each country, it is, however, fairer to take wheat and rye together. In this England is just surpassed by Belgium and Germany, and the supremacy of France is somewhat increased. The figures are as follows:—

England	47·8 bshls. of wheat and rye	Germany 48·3 bshls. of wheat and rye
Belgium	51·0 "	
France	59·5 "	Holland 30·5 "

Such rye as is grown in England is probably in great part used for feeding stock; on the other hand, it is quite certain that we raise some quantity of oats for human consumption, which is not the case on the continent. Making due allowance for this, we shall therefore almost certainly be safe in saying that we raise as much bread-corn per agriculturist as Belgium and Germany, though probably not so much as France.

As regards potatoes, the position is practically the same as in the case of the areas; in fact, our superiority in yield per acre is not evident as compared with Belgium, at least in the seasons selected. In roots our supremacy is most pronounced: over 20 tons in England, as against $9\frac{1}{2}$ in Belgium, only 3 in France, and $2\frac{1}{2}$ in Germany. It must not be forgotten that these figures include sugar-beet, which is practically non-existent here; although this variety of beet does not form so large a fraction of the roots as might perhaps have been anticipated.

I have already alluded to the untrustworthy character of the data relating to grass, and shall content myself with remarking that we appear to produce nearly twice as much as the Belgians, while the French and German yields are next to insignificant in comparison; we have, moreover, almost the certainty that the English production is much under-estimated.

Considering the produce of the soil as being destined for two objects, viz., the feeding of man or beast, it is a little curious to note that, of food for man,[10] a nearly identical quantity is produced per agriculturist in England, Belgium, and Germany; a little more in France, and something less in Holland. The superiority of the Englishman lies entirely in his additional production of food for stock, and in every branch of this it is so marked as to be overwhelming. Abroad, Belgium takes the lead in this respect, followed, at some interval, apparently by France. The number of head of live stock per agriculturist, given in Table II, shows that, as regards the United Kingdom (where, as Mr. Crawford shows, a great deal more meat is consumed), this pre-eminence is confirmed, but Belgium must be placed last, except as regards pigs.

The results thus sketched out can only be accepted as an indication of the relative position of the countries considered; and to that extent I believe them to be reliable, at least where the difference is not too fractional.[11] There are, as I have been careful to point out, various causes of probable error: the persons engaged in agriculture include the nurserymen, whereas the areas do not (this applies equally to all countries); there are differences in the seasons; the agricultural statistics relate to a year separated from the population returns by some interval; the British returns exclude holdings of one acre or less, &c., &c. For these reasons the figures of area and production per agriculturist—although expressed in round numbers—cannot be looked upon as accurate. Nevertheless, I think it extremely unlikely that the error in the case of cereals and live stock can be more than some 10 per cent.;

[10] Wheat, rye, and potatoes—with some oats in England, and allowing some deduction of potatoes for industrial purposes on the continent.

[11] *E.g.* in the area under potatoes, the probable error is not too small to prohibit almost any country, except England, from claiming pre-eminence.

the margin may perhaps be somewhat greater in the case of roots. The figures as to grass are, however, of a much more speculative character. The more serious of these errors, moreover, all tend to depreciate the British production as compared with the foreign.

The purpose of the foregoing remarks has been to show that if we devote so much more land to grass than the Belgian, Frenchman, or German, we do so in addition to producing as much of the direct requirements of human beings by the exercise of the same amount of labour. There can be in England but little land fit for cultivation which is not already so utilised : she has now a much greater percentage (75 per cent.) of the total area under crops and grass than other countries, and the growth of her population tends day by day to diminish this small remainder. An increase in the arable area must thus necessarily be at the expense of the pasture.

No doubt it is physically possible to bring more land under the plough, but how far it would pay is a question which has been sufficiently discussed by Mr. Crawford. Supposing, however, that it could be made to pay to break up the pasture, we should evidently require far more labour on the land; for, as I think I have shown, the example of the foreigner will not assist the individual to increase his production to any great extent. In fact, if every agriculturist produced no more than the Belgian, we should want fully twice as many workers as we now have. This alleged room for improvement is thus not a separate subject, but simply resolves itself into the old problem of how to attract the urban population back to the fields, an aspect of the question which cannot be discussed here. " Rural depopulation " and scarcity of labour are a familiar difficulty with the farmer in this country, and an examination of the methods of farming in foreign countries suggests no remedy beyond protection, which other considerations render undesirable.

The apparent superiority of the Englishman as a farmer is a little curious from one point of view ; for it is often maintained that the ownership of a bit of land, such as is more common on the continent than with us, is an incentive to work beyond that possessed by the labourer hired for a wage. Yet, man for man, the Englishman seems the better. Of course, the difference is not all muscle and energy, for the British farmer is better equipped with machinery and, probably, knowledge, and these are doubtless the main factors. And it would seem also that in the case of a farmer with only half-a-dozen acres or less under corn, it can hardly prove a saving, either in time or money, to obtain the expensive machinery requisite for the various operations—even with the powerful aid of co-operation. In fact, the enormous breadths that the American can sow or reap in a day with his labour-saving appliances are generally considered a very material cause of the low price at which he can put his corn on the market. It appears therefore quite conceivable that a change tending to reduce holdings to the size prevalent in foreign countries might prove extremely dangerous. The system which has grown up in this country is, after all, quite probably the one best suited to it.

VIII.— *Agricultural Returns of the United Kingdom for* 1899. *Acreage under Crops and* 1899, *and 4th June,* 1898, *in each Division of Great Britain;*

	England.		Wales.		Scotland.	
	1899.	1898.	1899.	1898.	1899.	1898.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Total area of land and water [a]	32,545,903	32,545,903	4,773,899	4,773,899	19,456,179	19,456,179
Total acreage under crops and grass [b]	24,735,961	24,757,490	2,823,456	2,826,774	4,897,690	4,892,767
Corn Crops—						
Wheat	1,899,827	1,987,385	53,898	58,960	47,256	55,861
Barley or bere	1,635,634	1,562,761	105,978	102,921	240,496	237,984
Oats	1,781,649	1,731,157	220,233	230,670	957,873	955,933
Rye	43,951	59,843	1,625	2,043	6,660	6,999
Beans	234,528	217,657	1,338	1,285	13,190	13,412
Peas	159,887	173,050	1,665	1,569	1,199	1,325
Total	5,755,476	5,731,463	384,737	397,448	1,266,674	1,271,424
Green Crops—						
Potatoes	387,715	365,432	32,982	32,797	126,985	126,362
Turnips and swedes	1,203,880	1,237,011	66,836	68,176	470,277	467,315
Mangold	363,302	342,962	8,855	7,854	1,785	1,419
Cabbage, kohl-rabi, and rape	156,490	150,254	3,579	3,119	12,967	12,351
Vetches or tares	174,529	181,846	1,581	1,917	9,831	9,849
Other green crops	124,040	121,349	1,041	1,161	2,478	2,296
Total	2,409,956	2,398,854	114,824	115,024	624,323	619,592
Clover, sainfoin, and grasses under rotation—						
For hay	1,622,603	1,779,341	198,046	199,959	394,234	402,251
Not for hay	1,184,007	1,143,467	196,641	180,599	1,212,420	1,205,733
Total	2,806,610	2,922,808	394,687	380,558	1,606,654	1,607,984
Permanent pasture or grass not broken up in rotation— [b]						
For hay	3,753,867	3,932,220	457,173	474,492	128,045	129,603
Not for hay	9,570,293	9,322,129	1,462,437	1,449,337	1,258,932	1,251,611
Total	13,324,160	13,254,349	1,919,610	1,923,829	1,386,977	1,381,214
Flax	465	895	10	4	1	3
Hops	51,843	49,735	—	—	—	—
Small fruit	64,867	63,438	1,106	1,044	5,553	5,271
Bare fallow	322,584	335,948	8,482	8,867	7,508	7,279
	No.	No.	No.	No.	No.	No.
Horses used solely for agriculture [e]	839,345	830,316	91,097	89,522	154,953	155,470
Unbroken horses—						
1 year and above	230,547	242,276	41,635	41,850	32,444	34,761
Under 1 year	93,920	91,033	21,242	20,582	11,447	11,350
Total of horses	1,163,812	1,163,625	153,974	151,954	198,844	201,581
Cows and heifers in milk or in calf	1,945,677	1,872,774	285,794	274,073	439,789	440,343
Other cattle—						
2 years and above	1,007,770	1,021,423	86,556	91,352	246,984	268,820
1 year and under 2	931,927	892,066	169,195	159,865	287,389	293,913
Under 1 year	956,478	888,040	195,146	176,487	243,015	243,208
Total of cattle	4,841,852	4,674,303	736,691	701,777	1,217,177	1,246,284
Ewes kept for breeding	6,096,168	5,878,162	1,332,756	1,272,959	3,031,913	2,986,811
Other sheep—						
1 year and above	3,489,128	3,608,672	854,906	827,675	1,696,566	1,767,511
Under 1 year	6,676,121	6,399,704	1,228,695	1,168,074	2,832,501	2,833,626
Total of sheep	16,261,417	15,886,538	3,416,357	3,268,708	7,560,980	7,587,948
Sows kept for breeding	317,041	305,756	40,884	39,177	17,986	17,267
Other pigs	1,908,379	1,773,142	217,270	199,404	122,253	116,849
Total of pigs	2,225,420	2,078,898	258,154	238,581	140,239	134,116

[a] Not including foreshore and tidal water.   [b] Not including mountain and heath land.
[e] Furnished by the Registrar-General for Ireland.

Grass; and Number of Horses, Cattle, Sheep, and Pigs; as returned upon the 5th June, with Particulars for Ireland, and Total for the United Kingdom.

Great Britain.		Ireland.		United Kingdom, including Isle of Man and Channel Islands.		
1899.	1898.	1899.	1898.	1899.	1898.	
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	
56,775,981	56,775 981	20,706,258	20,706,258	77,675,572	77,675,572	Total area of land and water ᵃ
32,457,107	32,477,031	15,215,357 ᶜ	15,191,152 ᶜ	47,795,270	47,792,474	Total acreage under crops and grass ᵇ
						Corn Crops—
2,000,981	2,102,206	51,859	52,862	2,055,283	2,158,465	Wheat
1,982,108	1,903,666	169,660	158,151	2,159,396	2,068,760	Barley or bere
2,959,755	2,917,760	1,135,675	1,165,295	4,109,964	4,097,791	Oats
52,236	68,795	12,111	12,384	64,440	81,285	Rye
249,056	231,964	1,988	1,712	251,191	233,827	Beans
162,751	175,944	426	537	163,325	176,628	Peas
7,406,887	7,400,335	1,371,719	1,390,941	8,803,599	8,816,756	Total
						Green Crops—
547,682	524,591	662,898	664,912	1,222,614	1,201,417	Potatoes
1,740,993	1,772,502	301,455	306,936	2,050,422	2,087,505	Turnips and swedes
373,942	352,235	62,714 ᵈ	55,941 ᵈ	437,807	408,812	Mangold
178,036	165,724	46,057 ᵉ	49,086 ᵉ	219,283	214,970	Cabbage, kohl-rabi, and rape
185,891	193,612	3,541	3,465	189,769	197,420	Vetches or tares
127,559	124,806	25,326	24,686	154,668	151,317	Other green crops
3,149,103	3,133,470	1,101,991	1,105,026	4,274,063	4,261,441	Total
						Clover, sainfoin, and grasses under rotation—
2,214,883	2,381,551	624,118	651,967	2,852,544	3,047,585	For hay
2,593,068	2,529,799	627,144	600,922	3,253,288	3,163,427	Not for hay
4,807,951	4,911,350	1,251,262	1,252,889	6,105,832	6,211,012	Total
						Permanent pasture or grass not broken up in rotation—ᵇ
4,339,085	4,536,315	1,494,459	1,522,326	5,839,379	6,065,299	For hay
12,291,662	12,023,077	9,947,859	9,868,624	22,261,293	21,913,400	Not for hay
16,630,747	16,559,392	11,442,318	11,390,950	28,100,672	27,978,699	Total
476	902	34,986	34,489	35,463	35,391	Flax
51,843	49,735	—	—	51,843	49,735	Hops
71,526	69,753	—ᶠ	—ᶠ	71,963 ᶠ	70,238 ᶠ	Small fruit
338,574	352,094	13,081	16,857	351,835	369,202	Bare fallow
No.	No.	No.	No.	No.	No.	
1,085,395	1,075,308	—ᶠ	—ᶠ	—ᶠ	—ᶠ	Horses used solely for agriculture ᵍ
						Unbroken horses—
304,626	318,887	—ᶠ	—ᶠ	—ᶠ	—ᶠ	1 year and above
126,609	122 965	—ᶠ	—ᶠ	—ᶠ	—ᶠ	Under 1 year
1,516,630	1,517,160	501,982	513,788	2,028,092	2,040,330	Total of horses
2,671,260	2,587,190	1,443,819	1,430,722	4,133,249	4,035,501	Cows and heifers in milk or in calf
						Other cattle—
1,341,310	1,381,595	1,011,548	1,027,543	2,357,207	2,414,205	2 years and above
1,388,511	1,345,844	993,300	982,241	2,391,250	2,337,184	1 year and under 2
1,394,639	1,307,735	1,058,605	1,045,736	2,462,990	2,362,322	Under 1 year
6,795,720	6,622,364	4,507,272	4,486,242	11,344,696	11,149,212	Total of cattle
10,460,837	10,137,932	} 2,554,632	2,517,892	19,097,534	18,897,390	Ewes kept for breeding / Other sheep—
6,040,600	6,203,858					1 year and above
10,737,317	10 401,404	1,809,444	1,769,382	12,582,691	12,204,969	Under 1 year
27,238,754	26,743,194	4,364,076	4,287,274	31,680,225	31,102,359	Total of sheep
375,911	362,200	—ᶠ	—ᶠ	—ᶠ	—ᶠ	Sows kept for breeding
2,247,902	2,089,395	—ᶠ	—ᶠ	—ᶠ	—ᶠ	Other pigs
2,623,813	2,451,595	1,363,311	1,253,682	4,003,589	3,719,219	Total of pigs

ᵈ Including beetroot.   ᵉ Cabbage and rape only.
ᶠ Not separately shown for Ireland.   ᵍ Including mares kept for breeding.

Produce of Wheat, Barley, and Oats. Preliminary Statement showing the Estimated Total Produce and Yield per Acre of Wheat, Barley, and Oats in Great Britain in the Year 1899, with Comparative Statements for the Year 1898, and for the Average of the Ten Years 1889-98.

WHEAT.

	Estimated Total Produce.		Acreage.		Estimated Yield per Acre.		Average of the Ten Years 1889-98.
	1899.	1898.	1899.	1898.	1899.	1898.	
	Bshls.	Bshls.	Acres.	Acres.	Bshls.	Bshls.	Bshls.
England	62,380,067	69,074,387	1,899,827	1,987,385	32·83	34·76	29·85
Wales	1,380,938	1,582,086	53,898	58,960	25·62	26·83	24·03
Scotland	1,768,320	2,372,383	47,256	55,861	37·42	42·47	36·94
Great Britain.	65,529,325	73,028,856	2,000,981	2,102,206	32·75	34·74	29·86

BARLEY.

England	56,164,313	55,377,522	1,635,634	1,562,761	34·34	35·44	33·16
Wales	3,328,494	3,377,413	105,978	102,921	31·41	32·82	29·87
Scotland	8,222,891	9,296,983	240,496	237,984	34·19	39·07	36·29
Great Britain.	67,715,698	68,051,918	1,982,108	1,903,666	34·16	35·75	33·26

OATS.

England	73,905,288	75,282,761	1,781,649	1,731,157	41·48	43·49	40·84
Wales	7,527,952	8,389,938	220,233	230,670	34·18	36·37	33·06
Scotland	33,313,304	35,248,218	957,873	955,933	34·78	36·87	36·74
Great Britain.	114,746,544	118,920,917	2,959,755	2,917,760	38·77	40·76	38·86

IX.—*Notes on Economical and Statistical Works.*

Statistics and Economics. By Richmond Mayo-Smith, Ph.D. 467 pp., 8vo. 12s. 6d. New York: The Macmillan Company, 1899.

Under the title *Statistics and Sociology*, we had the pleasure some four years ago of calling attention to the first part of the work to which the present volume forms the second. We then called attention principally to the order observed in the grouping of the material under each of the several heads treated. The order observed in the first part of the treatise is a conspicuous feature of the second, and should be found an assistance to students who desire to learn something of statistical method and practice, in showing them what can be done with existing material, and for what it is inadequate We do not say that we agree with Dr. Mayo-Smith in all his conclusions on this last head, but it is certainly more useful to inquire whether a given mass of material can be used for a stated purpose, than to attempt blindly to use any material at

hand for any purpose, whether it be adapted to meet the end in view or not. Readers of the volume before us will not fail to have the importance of such considerations forced on their attention.

In the discussions on economic purpose and the reflective analysis, which respectively introduce and conclude each section of the work, opportunity is found for some outlines of general economic theory and for indicating the place of various institutions in the economic organisation of modern society, which will probably be helpful to readers who have not made any systematic study of economics. Of course there are dangers in such necessarily brief observations, and if they were taken together as a text-book on economic theory, instead of related to a study of statistics in connection with economics, there might be no little ground for criticism; but they must be considered in relation to the purpose they have to serve.

In footnotes are found bibliographical tables indicating some of the more important sources of statistical information. The volume should be of service in aiding a careful and intelligent study of statistics.

The Economic Writings of Sir William Petty. Edited by C. H. Hull, Ph.D. 2 vols., 8vo. 25s. Cambridge University Press, 1899.

The publication of a collected edition of the writings on economic and statistical subjects of that eminent seventeenth century author, will afford many the opportunity, which has not hitherto been within their reach, of making themselves acquainted at first hand with Sir William Petty's work. That the editor hails from Cornell University may appear somewhat strange, and it is pleasing to find that, whatever economic work has been achieved in recent years in America, it is in England that publishers have been sought and found for this book. Its issue is at least as great a service to economic students as the valuable translations of the works of foreign writers which we have been glad to note from time to time as proceeding from American presses. Both editor and publishers are to be heartily congratulated on their enterprise and on the excellence of the work done.

Of the biographical notes which are prefixed to the volume we need say nothing so far as they concern Petty. The part dealing with John Graunt is a necessary and useful sketch, inasmuch as the "natural and political observations upon the bills of mortality" are included in the volumes. An article dealing with the disputed authorship of these papers, which appeared in the *Political Science Quarterly*, is reprinted as introductory matter to this book, the strong conclusion of the writer, the editor of the work before us, being against the claim made for assigning their authorship to Petty rather than Graunt. Further introductory notes deal with Petty's letters and other manuscripts, and with his economic writings: the latter, by calling attention to the nature and limitations of the materials Petty had at his disposal, renders considerable assistance to a proper estimation of his work, as well

as suggesting some thoughts as to the relation of his ideas to those of later times. The other editorial work, the bibliography of Petty's printed writings, the footnotes, index, &c., all bear witness to the thoroughness with which Dr. Hull has given himself to his task, which merits the pains bestowed upon it. It will now fortunately be easy to become acquainted with the author of *Political Arithmetick.*

Taxation, Local and Imperial, and Local Government. By J. G. Graham. Third edition. Revised and enlarged by M. D. Warmington. 122 pp., 8vo. 2s. London: P. S. King and Son, 1899.

The re-issue of this convenient little handbook has been made an occasion for bringing the information contained in it down to a later period than that given in former editions. We observe that this has not been done quite uniformly, and it is not a little curious to read, as a reason for estimating a figure for one year from that actually returned for the next following year, that the author or editor did not possess the return for the year to which he desired to refer. One would have imagined it possible to refer to a copy of any return dealing with the year 1884 if the figures for that year were wanted. We note, too, that the usual reference to 1601 as the date of establishment of any general organisation for the relief of the poor, and of any really compulsory method of raising funds for the purpose, is made. The practice of such assessments did not become at once universal even after 1601, and a power to make them was certainly given in 1572, in 14 Elizabeth, cap. 5, sec. 16. It is convenient to begin one's history of English poor law from 1601, but the use of phrases which imply that everything preceding that date may safely be regarded as unimportant, is rather misleading.

The brief statement of the amounts of all the principal taxes levied, and some outline of their history, with a summary of the various orders of local authorities, and the powers and duties entrusted to or imposed on them, will be found convenient by many who desire to know the leading facts, and have neither time nor inclination to consult elaborate works on the subject. The question of reform in local taxation is raised in the volume, and if it supply material to enable some opinion on that important matter to be formed by its readers, it will render a service of no small value at the present time.

Die Methode der Variationsstatistik. Von Georg Duncker. 75 pp., 8vo. Leipzig, 1899.

In the *Archiv für Entwickelungsmechanik* appears an account, for the use of German biologists, of the recent work in applying mathematical methods to statistics of variation in which English writers, and prominently Mr. Galton and Professor Pearson, have taken so large and important a share. It is a useful and compendious statement of the methods used, with examples of their application. In appendices are given a bibliography and a collection of formulæ employed in the work. Such a brief recapitulation of the newer statistical methods would be found useful, perhaps, by

others than the Germans for whom this has been prepared. A worker, even in this field, might well desire not to be under the necessity of seeking what he wants in more or less scattered memoirs. It is not always that the accounts of new methods by those who first employ them are in the form most desired by those who, later on, desire to become acquainted with them.

Arbeiderkommissionens Socialstatistik. 3 vols., 8vo. Kristiania, 1898-99.

The inquiries made by a labour commission as to the general welfare and industrial conditions of the Norwegian population have resulted in the gathering of a vast mass of statistical material, a first instalment of which is published in the three volumes which are now issued under the title given above. The inquiry is of interest, not merely for its results, but for its methods. An exhaustive return of the various particulars of the condition of every family in the country would have been a matter far beyond the means available or the needs of the case. The plan adopted has therefore been to make an inquiry in a very careful way covering a sample of the population, so distributed in age, geographical location, industrial position, &c., as to afford as nearly as possible a reduced picture of the condition of the population at large. What care had to be exercised to effect this end can be easily imagined. No dependence on the casual response of individuals to a general request to fill up a schedule posted to them, and to return it to the offices of the commission, such as has had to serve our statistical officials, would have been of any great use. An inquiry by properly instructed investigators, arranged on a careful detailed plan, has, however, been contrived, to give a body of material touching families so distributed as to approach very closely to the average distribution in industry, locality, and age of the adult population. Thus 81,942 schedules give details for about one-sixteenth of the adult population, and the results compiled from the information thus provided may be taken to represent fairly the general conditions of the people in such matters as earnings, age of commencing work, and the like. Some tests are also given by comparison with statistics otherwise obtained as to the total income of the country and its grouping according to magnitude, &c., which confirm the representative character of the material.

Additional information has been acquired to supplement that of the 81,942 schedules in points where it seemed not quite satisfactorily representative; as, for example, in including too large a proportion of married persons. The interest of the material now published is an earnest of the value of what remains behind, touching such points as the extent of sickness, the amount of accident and old-age infirmity which an insurance of the whole population would have to meet, and many other points.

Among the more interesting results of the tables now published are figures showing the age at which the individuals who are included in the inquiry commenced work. These are again grouped according to industry and the date of commencing work,

thus tracing the changes in custom which a half century has developed. Returns for the two sexes separately are also given. In considering the results, the fact that nearly three-quarters of the individuals concerned were resident in the country districts must not be forgotten, for town and country are somewhat widely contrasted, both in regard to the ordinary age of entry on industrial labour and the changes in that respect in the course of the last generation or so. Taking the whole country, of those contributing to the inquiry as to conditions at the end of 1894, nearly 30 per cent. had begun work between the ages of 6 and 13. In the following three years of age, 14—16, nearly 59 per cent. had started work. Thus the age of confirmation is shown to be by far the most usual age for commencing work. In the towns the proportion who started work before reaching their fourteenth year was less than $7\frac{1}{2}$ per cent., while it was nearly $37\frac{1}{2}$ in the country. The numbers in the towns are further indicative, not of the age of beginning work in the towns themselves, but of that at which the present inhabitants of towns, whether immigrants or town-born, began work.

Tracing the progress of events according to the date at which the individuals began their industrial life, the proportion who began as children is seen to have steadily decreased. In the country districts it has decreased rapidly, from about one-half to less than a quarter; in the towns even more rapidly, from about one-sixth to about 4 or 5 per cent. only, comparing those who began before 1855 with those who began in the decade 1885-94. However one looks at these figures they must be taken to indicate a large degree of improvement in the condition and ideals of the people. It may be urged that the survivors of those who began their working life before 1855 do not give an exact sample of the conditions and habits of the population as it was forty years ago; but, with all such allowances, the increase of the age of beginning work, the devotion of more time to preparation for work, is marked. Confirmatory tests by other groupings of the ascertained facts are given.

The tables showing the industry in which the entry on working life was made bring out somewhat sharply the lessening importance of agriculture and the growing importance of manufacture and commerce, and also illustrate the strong tendency to start a son in life in the same industry as that followed by his father, or one closely related to it. Here again, too, is shown the delay in beginning work so as to place this step more and more after the attainment of the fourteenth year instead of before it. The tables showing changes of occupation, by comparing that first entered on with that followed in 1894, are very instructive, but we cannot here enter on the facts shown.

In the returns of wages earned we have the wages when first work was begun, and also those earned in 1894. No little difficulty arises through the extensive practice of paying part or the whole of the wages in kind—board and lodging, and sometimes clothes as well, taking the place of money wages, or being obtained together with a certain money wage. The growth of the practice

of paying in money, and in money exclusively even, is illustrated, and the general rise in earnings is clearly and strikingly brought out. Another point, the illustration of which is generally impossible from returns of earnings grouped according to amount, is that the greatest number of incomes is not found in the lowest group. In fact the grouping proceeds further in the downward direction than most returns of incomes, and shows a maximum frequency in the neighbourhood, not of the minimum, but of the average income. The separation of income from labour, and that from property owned, is also instructive.

Both in the method adopted and in the novelty of some of the features of the economic status of the Norwegian population which it has been found possible to illustrate, this inquiry is deserving of careful attention. The chief of the statistical bureau, Direktör Kjær, and his collaborator, Pastor Hanssen, have carried out a piece of investigation on which they are to be congratulated; and the further results of their labours will be anticipated with great satisfaction by those who find opportunity to examine closely what is now published of their work.

Danmark's Haandvœrk og Industri. 214 pp., 4to. Copenhagen, 1899.

The statistical bureau of Denmark has issued, as the first number of a new series in its *Statistisk Tabelvœrk*, the results of the first complete industrial census ever made for that country, that of 25th of May, 1897. Various partial inquiries have been made from time to time, both privately and publicly, but it has remained for Direktör Rubin, in the year of celebration of the half-century from the establishment of his department on the footing of a bureau, to issue this account of the first general industrial census. Of its contents we can indicate but little in the space at our disposal : 77,256 establishments, with 270,622 persons engaged, are included in the tables. Only 7,139 of these establishments, however, employed mechanical motive power, so that the majority are clearly of the small workshop variety. In fact just over one-third of the total number employed only from 1 to 5 workmen, while no less than 42,559 had no employés enumerated with them. Establishments with 50 workers each and over accounted for about 30 per cent. of the employés. The tables separate the facts for Copenhagen, for the other towns, and for country districts.

It is interesting to notice that metal industries account for 14·34 per cent., textile industries for 6·62 per cent. of the employed. The separation of ordinary workpeople from over-lookers and also from porters, messengers, &c., as well as from employers, is a detail which throws valuable light on the organisation of various establishments. Of the workpeople 20·8 per cent. were females, and, classed by age, the sexes contrast in that though about equal proportions in each fall between 14 and 22 years of age, among the males the age-group 14—18 is slightly more important in numbers than the age-group 18—22, while among females the former age-group is less than one-half as

important as the latter. The percentage of the total of employed who were under 14 years of age is 2·8 for males, 2·5 for females. In the paper industry, however, the percentage of children reached 9·9, and was 5·7 in the textile industries. A further feature is that, of women over 22 who were employed, 39·5 per cent. were married.

From the returns of birthplaces, it is noteworthy that two-thirds of the employed in the kaolin works, over three-fifths in the heavier pottery, and well over one-half in tailoring were of Swedish birth.

The extent to which independent self-employment still remains in Denmark may be illustrated in many ways from the tables; but perhaps the fact that of all males over 22 years of age in the towns, including Copenhagen, barely one-third were returned as workpeople, illustrates the point sufficiently. Home work accounted for only 2 per cent. of the employed males, but for 26·6 per cent. of the employed females. The greatest employment of home work was in pin and needle making, in glove making, and in the production of knitted goods, in all of which over three-fifths of the workers were home workers.

In the returns of the length of period during which the various establishments had been at work, the most striking feature in English eyes will probably be the tremendous development of co-operative dairies, of which only 2·7 per cent. date from before 1880, while 60 per cent. were established in the five years 1886-90. The annual value of the production of these dairies totals up to over 5,800,000*l.*

The tables also deal with the extent of mechanical motive power employed in establishments of different sizes, and with numbers of boilers used. For any details on these points, however, reference will best be made to the tables themselves.

Ergebnisse der in Österreich vorgenommen Gewerbezählung nach dem stande vom 1 Juni, 1897. 381 pp., 4to. Wien, 1899.

In addition to a census of industrial establishments for the particular date 1st June, 1897, the tables contained in this report show the changes which were registered in the figures for that date in the course of the year then beginning, that is, to 31st May, 1898. The direction and rapidity of industrial changes are thus indicated in some degree. In contrast with former returns of industrial statistics of Austria, the present volume adopts a new classification of industries, the older arrangement having become unsatisfactory through the modern changes in industrial conditions.

The total of establishments entered in the tables for 1st June, 1897, is 883,226. Of these, in the twelve months, 61,898 ceased to exist, 83,562 new ones were started, and 7,841 other changes took place, making a total of 17 per cent. of changes in the year, with a net increase in numbers of nearly 2½ per cent. In certain branches of trade the changes ran up to over 40 per cent. of the number of establishments enumerated. In the important (in point of numbers) industries of boot making, manufacture of

men's and boys' clothes and furniture making, the rate of change is expressed by 12 per cent., but the net increase of establishments in these industries, which include about one-seventh of the total enumerated, averaged only about three-quarters of 1 per cent., as against the $2\frac{1}{2}$ per cent. already named as applying to the whole country. Trading concerns show a much greater rate of alteration than productive industries, while the transport industries show a somewhat less rate.

The grouping of the industries by localities shows that over 30 per cent. of the establishments were found in Bohemia, and Vienna showed more than double as many establishments as Prague, Graz, Lemberg, and Brünn together. The relative importance, whether measured by labour engaged, mechanical power employed, or value of output, is not shown. Even in respect of this one feature—numbers of establishments in different trades and their geographical grouping—it is difficult to obtain comparisons between various features readily, through a lack of summarised tables and an all too brief introduction. The inquirer must for most purposes take out and sum for himself the figures he needs. This renders the work of preparing these elaborate tables of less utility to the curious seeker for information which seems likely to be found in them, than they might have been made had they been digested more thoroughly in the offices where they were drawn up.

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No. 1—Les sociétés anonymes industrielles de Budapest. Services administratifs pour les affaires industrielles (*continued in next number*). La Bourse de marchandises et de valeurs de Budapest. La protection des ouvriers en Hongrie. La caisse d'épargne postale de Hongrie. Les établissements de crédit en Hongrie. Le réseau des railways urbains de Budapest. Le budget des chemins de fer de l'État pour 1899. La navigation intérieure de la Hongrie (*continued in next number*). Le service postal, télégraphique et téléphonique de la Hongrie. La statistique officielle hongroise.

No. 2—L'Industrie verrière en Hongrie. Les entreprises par actions en 1898 et le mouvement de la mutualité. L'Organisation du placement des ouvriers. Ouvriers malades employés au service de la ville de Budapest. Le budget de 1899 de la Caisse d'épargne postale. Association nationale centrale de crédit mutuel. Statistique de chemins de fer. Les recensements industriels et ouvriers. La protection des marques de fabrique en Hongrie. Relevé statistique des travaux de l'Office national hongrois des Brevets.

No. 3—L'Industrie du Bois en Hongrie. L'Approvisionnement de Budapest. L'Industrie de l'Alcool en Hongrie. Les Progrès du Système des Chèques en Hongrie. Les Conditions de Concession et d'Exploitation des Chemins de fer d'Intérêt local en Hongrie. Réglementation de la Navigation aux Portes-de-fer. Le Service postal, télégraphique et téléphonique de Budapest pendant l'année 1898. La Protection des Marques de fabrique et des Echantillons et Modèles en Hongrie.

No. 4—Le Musée Commercial Hongrois. Dispositions concernant l'Hygiène des Travailleurs dans les Etablissements industriels en Hongrie. Le Budget des Chambres de Commerce et d'Industrie pour l'année 1899. L'impôt sur les Ouvriers industriels. Chaudières à vapeur fonctionnant en Hongrie en 1898. Mesures de sûreté relatives aux Chaudières à vapeur, Machines à vapeur et Transmissions. L'Organisation du Crédit hypothécaire en Hongrie. Les

H<small>UNGARY</small>—*Contd.*

   La Hongrie Economique, 1899. *Revue trimestrielle—Contd.*

      Chemins de fer d'Intérêt privé en Hongrie. Le Transport de grands Ballots de Journaux par des Particuliers. La Statistique Industrielle en Hongrie. Organisation, Compétence et Fonctionnement du Bureau royal hongrois des Brevets.

I<small>TALY</small>—

   Giornale degli Economisti—

      October, 1899—Utilità limite e costo di Produzione: *D. Berardi.* Come funziona la corte dei conti italiana: *V. Tangorra.* Di un programma e di un partito liberale in Italia: *E. Giretti.*

      December, 1899—La terra libera e la generazione del profitto: *G. Valenti.* Utilità limite e costo di riproduzione: *D. Berardi.* La diffusione della pellagra in Italia: *P. Sitta.* I sindacati professionali operai in Francia: *A. Bertolini.*

   Rivista Italiana di Sociologia. July, 1899—Il presente e l' avvenire nelle nazioni: *G. Sergi.* La sociologia ed il suo valore nell' odierno movimento scientifico e sociale: *A. Loria.* Le morti violente dei principi russi dal secolo x al secolo xv: *E. Tarnowski.*

R<small>USSIA</small>—

   Bulletin Russe de Statistique Financière. Nos. 4/6—Sociétés étrangères par actions autorisées à fonctionner en Russie. Liste complète des sociétés belges, françaises, allemandes, anglaises, autrichiennes, suisses, &c. Cours et dividendes pour les dernières années des actions de sociétés commerciales et industrielles cotées à la Bourse de St. Pétersbourg. Chemins de fer: Résultats détaillés de l'exploitation (comptes d'exercice) du réseau russe en 1895-97. La production des rails en Russie de 1846 à 1874 et de 1883 à 1895. Banques foncières par actions; Leur capital nominal et les versements effectifs des actionnaires. Liste complète des 230 sociétés russes, au capital global de 369 millions r., qui exploitent l'industrie textile. Réforme monétaire; Loi monétaire du 7 juin, 1899. Tableaux divers sur les exportations et les importations de la Russie pendant les dernières années connues. Trente-cinq milliards de francs de forêts plus ou moins explorées. Caisses d'épargne; Mouvement des dépôts en mai, 1899.

S<small>WITZERLAND</small>—

   Journal de Statistique Suisse. Band 11, 1899—

      Lief. 5—De la mortalité par homicide de 1892 à 1896 dans la Confédération suisse: *Dr. G. Rœhring.* Les légitimations d'enfants par mariage subséquent des parents en Suisse en 1898. Die schweizerische Armenpolizei: *Dr. J. Räber.* Tableau de l'émigration suisse en 1898 par districts.

      Lief. 6—Betrachtungen über den Finanzhaushalt der Kantone und ihre Beziehungen zum Bund: *Dr. J. Steiger.*

X.—*Quarterly List of Additions to the Library.*

Additions to the Library during the Quarter ended 15th December, 1899, *arranged alphabetically under the following heads:*—(a) *Foreign Countries;* (b) *India and Colonial Possessions;* (c) *United Kingdom and its Divisions;* (d) *Authors, &c.;* (e) *Societies, &c. (British);* (f) *Periodicals, &c. (British).*

The Society has received, during the past quarter, the current numbers—either quarterly, monthly, or weekly—of the periodical official publications dealing with the following subjects:—

Consular Reports—From Austria-Hungary, United States, and United Kingdom.

Labour Reports, &c.—From Belgium, France, United States, New York State, New Zealand, and United Kingdom.

Trade Returns—From Argentina, Austria-Hungary, Belgium, Bulgaria, China, Egypt, France, Germany, Greece, Italy, Mexico, Netherlands, Russia, Spain, Sweden, United States, India, Canada, and United Kingdom.

Vital Statistics—From Argentina, Egypt, Germany, Italy, Netherlands, Roumania, Switzerland, United States (Connecticut and Michigan), Queensland, South Australia, and United Kingdom.

Vital Statistics of following Towns—Buenos Ayres, Brünn, Prague, Brussels, Copenhagen, Berlin, Dresden, Hanover, Bucharest, Madrid, Montevideo, London, Manchester, Dublin, Edinburgh, and Aberdeen.

The Society has received during the past quarter the current numbers of the following unofficial Periodicals and Publications of Societies, &c., arranged under the Countries in which they are issued:—

Denmark—Nationalökonomisk Tidsskrift.

Egypt—Bulletins et Mémoires de l'Institut Égyptien.

France—Annales des Sciences Politiques. Économiste Français. Journal des Économistes. Monde Économique. Polybiblion, Parties Littéraire et Technique. Réforme Sociale. Le Rentier. Revue d'Économie Politique. Revue Géographique internationale. Revue de Statistique. Musée Social, Circulaires, &c. Société de Statistique de Paris, Journal.

Germany—Archiv für Soziale Gesetzgebung und Statistik. Jahrbuch für Gesetzgebung. Verwaltung, und Volkswirtschaft. Jahrbücher für National-ökonomie und Statistik. Zeitschrift für die gesamte Staatswissenschaft. Zeitschrift für Socialwissenschaft.

Italy—L'Economista. Giornale degli Economisti. Rivista Italiana di Sociologia.

Spain—Sociedad Geografica de Madrid, Boletin y Revista.

Sweden—Ekonomisk Tidskrift.

Switzerland—Journal de Statistique suisse.

United States—Banker's Magazine. Bradstreet's. Commercial and Financial Chronicle, with supplements. Engineering and Mining Journal. Journal of Political Economy. Political Science Quarterly. Quarterly Journal of Economics. Yale Review. American Academy of Political and Social Science, Annals and Bulletin. American Economic Association, Economic Studies and Publications. American Geographical Society, Bulletin. American Statistical Association, Quarterly Publications. American Philosophical Society, Proceedings. Columbia University, Studies in History, &c. Sound Currency Committee, Leaflets.

India—Indian Engineering. Asiatic Society of Bengal, Journal and Proceedings.

Unofficial Periodicals and Publications of Societies, &c.—*Contd.*

Canada—The Chronicle: Insurance and Finance.

New Zealand—Government Insurance Recorder. Trade Review and Price Current.

United Kingdom—The Accountant. Accountants' Magazine. Athenæum. Australian Trading World. Bankers' Magazine. Bimetallist. British Trade Journal. Building Societies and Land Companies Gazette. Citizen. Colliery Guardian. Commercial World. Cotton. Economic Journal. Economic Review. Economist. Fireman. Incorporated Accountants' Journal. Insurance Post. Insurance Record. Investors' Monthly Manual. Investors' Review. Iron and Coal Trades' Review. Labour Co-partnership. Licensing World. Machinery Market. Nature. Policy-Holder. Post Magazine. Public Health. Sanitary Record. Shipping World. Statist. Anthropological Institute, Journal. Cobden Club, Leaflets. East India Association, Journal. Imperial Institute, Journal. Institute of Actuaries, Journal. Institute of Bankers, Journal. Institution of Civil Engineers, Minutes of Proceedings. Iron and Steel Institute, Journal. Lloyd's Register of British and Foreign Shipping, Statistical Tables. London Chamber of Commerce, Journal. Manchester Literary and Philosophical Society, Memoirs and Proceedings. Royal Agricultural Society, Journal. Royal Asiatic Society, Journal. Royal Colonial Institute, Proceedings. Royal Geographical Society, Geographical Journal. Royal Irish Academy, Proceedings and Transactions. Royal Meteorological Society, Meteorological Record and Quarterly Journal. Royal Society, Proceedings. Royal United Service Institution, Journal. Sanitary Institute, Journal. Society of Arts' Journal. Surveyors' Institution, Professional Notes and Transactions.

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Argentine Republic—	
Anuario de la Direccion General de Estadistica correspondiente al año 1898. Tomo i. 8vo....................	The Director-General of Statistics
Sinopsis Geologico-Paleontologica. Suplemento. Fol. 1899	The Census Commission
Buenos Ayres (Province)—	
Anuario Estadistico. Años 1896 y 1897. 2 vols. 8vo.	The Provincial Statistical Bureau
Boletin mensual de Estadistica de la Policia. Año v, No. 1. Enero, 1899. (Criminal Statistics.)	The Chief of Police
Austria-Hungary—	
Ackerbau- Ministeriums. Statistisches Jahrbuch des k.k., für 1898. Heft 2, Lief. 1, Bergwerks-Production in 1898	The Ministry of Agriculture
Arbeitsstatistisches Amt. Protokoll der vierten Sitzung des Arbeitsbeirathes . . . 1899. 8vo............	
Ergebnisse der in Osterreich vorgenommenen Gewerbe-Zählung nach dem Stande vom 1 Juni, 1897. 4to.	The Austrian Labour Department
Stenographisches Protokoll . . . durchgeführten Vernehmung von Auskunftspersonen über die Verhältnisse in der Kleider- und Wascheconfection. 4to.	
Handels. Statistik des Auswärtigen, des österr.-ungarn. Zollgebiets. Jahr 1898. Band ii (Special-Handel). Band iii (Vormerkverkehr-Durchfuhr)....	The Statistical Department Ministry of Commerce
Österreichisches Statistisches Handbuch für 1898. 8vo.	
Österreichische Staatshaushalt in 1895 und 1896	The Central Statistical Commission
Rechtspflege. Statistische Nachweisungen über das Civilgerichtliche Depositenwesen . . . Jahr 1896	
Statistische Monatschrift. (Current numbers)	

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(a) **Foreign Countries**—*Contd.*

Austria-Hungary—*Contd.*

Statistische Nachrichten aus dem Gesammtgebiete der Landwirtschaft. (Current numbers) .... — The Central Statistical Commission

Hungary. La Hongrie économique. Revue trimestrielle publiée sous le patronage du Ministère du Commerce. 1e année, Nos. 1—4. La. 8vo. 1899 — The Publishers

Bosnia and Hercegovina—

Die Landwirthschaft in Bosnien und der Hercegovina. Plates and diagrams, la. 8vo. 1899 .... Veterinärwesen seit 1879, nebst einer Statistik der Epizootien und des Viehexportes bis inclusive 1898. Diagrams. 8vo. .... — The Bosnian Department of Agriculture

Belgium—

Annuaire Statistique de la Belgique. 29e année, 1898. Maps ....
Caisse générale d'epargne et de retraite. Compte rendu des opérations et de la situation. Année 1898. Sm. fol. ....
Commerce avec les Pays Étrangers. Tableau Général du, pendant 1898. Diagrams. La. fol. ....
Enseignement moyen en Belgique. Rapport triennal, quinzième période 1894-95-96. Fol. 1899 .... — The Bureau of General Statistics

Annuaire de la legislation du Travail. 2e année, 1898. 8vo. ....
Industries à domicile en Belgique, vol. i. L'industrie armurière liégeoise. L'industrie du vêtement pour homme à Bruxelles. L'industrie coutelière de Gembloux. Maps, &c. 8vo. 1899 ....
Mines. Annales des. Tome iv. Livr. 4. Année 1899
Rapports annuels de l'Inspection du Travail. 4e année, 1898. 8vo. .... — The Belgian Labour Department

Brussels. Rapport sur les opérations de la Division d'Hygiène . . . pendant 1898. Diagrams. 8vo. .... — Dr. E. Janssens

Academie royale de Belgique—

Annuaire, 1898 et 1899. 2 vols., plates. Sm. 8vo.
Bulletins. Vols. 34—36, 1897-98. 3 vols., plates.
Tables générales du recueil des Bulletins. 3e serie. Tomes 1—30, 1881-95. 8vo. 1898 .... — The Academy

Bulgaria—

Commerce avec les Pays étrangers pendant 1896 ....
Ecoles dans la Principauté. Statistique des, pendant 1897-98. La. fol. 1ère partie, écoles primaires. — The Statistical Bureau

China—

Customs Gazette. April—June, 1899 ....
Returns of Trade and Trade Reports for 1898. Part 2. Statistics for each port, with report on Foreign Trade of China, and Index to Annual Trade Reports, 1893-97. Diagrams, 4to. .... — Sir Robert Hart, Bart., G.C.M.G.

Denmark—

Statistisk Bureaus Historie et omrids, udarbejdet i anledning af Bureauets 50-aarige bestaaen. Avec un précis en français. 184 pp., 8vo. 1899 .... — The Statistical Bureau of Denmark

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(a) **Foreign Countries**—*Contd.*	
France—	
Agriculture. Bulletin du Ministère de l'. Année 1899. (Current numbers)	The Ministry of Agriculture
Chemins de fer français. Statistique des, au 31 Déc., 1897. Documents divers. 2ᵉ Partie .... Chemins de fer de l'Europe. Situation au 31 Décembre, 1898. Ouvertures en 1898. 6 pp., 4to.	The Ministry of Public Works
Finances, Ministère des. Bulletin de Statistique et de Législation comparée. (Current monthly numbers.)	The Ministry of Finance
Justice civile et commerciale en France et en Algérie. Compte général de l'Administration de la, 1896. 4to. Justice criminelle en France et en Algérie. Compte général de l'Administration de la, pendant 1896. 4to.	The French Government
Monnaies et Médailles. Administration des, Rapport au Ministre des Finances. 4ᵉ année, 1899. Diagrams and plates, 8vo.	The Director of the Mint
Navigation intérieure. Statistique de la, Relevé général du Tonnage des Marchandises. Année 1898. 2 vols., maps, &c., 4to. 1899	The Ministry of Public Works
Statistique générale de la France. Tome xxvii. Statistique Annuelle (année 1897). (Institutions et établissements d'assistance et de bienfaisance.)	The French Labour Department
Tableau général du Commerce et de la Navigation. Année 1898. 2 vols., la. 4to.	The Director-General of Customs
Travail. Les Associations professionelles ouvrières. Tome i, Agriculture, Mines, Alimentation, Produits chimiques, Industries polygraphiques. 8vo. 1899	The French Labour Department
Annuaire de l'Économie Politique et de la Statistique, 1899	Purchased
Dictionnaire du Commerce, de l'Industrie, et de la Banque. Livr. 9. 8vo. 1899....................	The Publishers
Germany—	
Berufs- und Gewerbezählung, 1895. Gewerbe und Handel. Diagrams, 4to. .... Handel. Auswärtiger, des deutschen Zollgebiets im Jahre 1898. Theil 1. Der auswärtige Handel nach Menge und Werth der Waaren-Gattungen und der Verkehr mit den einzelnen Ländern. 4to.... Kriminalstatistik für 1896, Erläuterungen. Diagram, 4to.	The Imperial Statistical Bureau
Statistisches Jahrbuch Deutscher Städte. 7ᵉʳ Jahrgang. 8vo. 1898	Purchased
Vierteljahrshefte zur Statistik des Deutschen Reichs. Jahrgang 1899. Heft 4. 4to.	The Imperial Statistical Bureau
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Berlin. Arbeiter-Kranken-Versicherung in Berlin im Jahre 1898. 4to.	The Municipal Statistical Bureau

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Jahresbericht des Frankfurter Vereins für Geographie und Statistik. Jahrgang 1896-99............	The Society
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Annali di Agricoltura, 1899. Atti del Consiglio ippico dal 1894 al 1898. No. 222	
Movimento Commerciale nell' anno 1898. 2 vols., fol. diagrams	
Movimento della Navigazione nel 1898. Parte 1—4 in 2 vols., diagrams, fol.	The Director-General of Statistics
Notizie complementari alle Statistiche giudiziarie penali degli anni 1890-95	
Statistica giudiziaria penale per l' anno 1897	
Japan—	
14th Statistical Report of the Agricultural and Commercial Department (entirely in Japanese), 1899. Maps and diagrams, 8vo.	The Department
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Amonedacion e Introduccion de Metales Preciosos a las Casas de Moneda . . . Año fiscal de 1895-96. Diagrams, fol.	The Statistical Bureau
Boletin de Estadistica fiscal. No. 193. Segundo semestre de 1898-99	
Censo general, 1895. 5 parts, 8vo.	
Netherlands—	
Annuaire Statistique des Pays-Bas. (Métropole.) 1898	The Central Statistical Bureau
Statistiek van den In-, Uit-, en Doorvoer over het Jaar 1898. Gedeelte 1 und 2. Fol.	The Director-General of Customs, &c.
Verslag . . . . van de Bevindingen en handelingen van het geneeskundig staatstoezicht in het Jaar 1897. Diagrams, 4to. 1899..	The Ministry of the Interior
Rotterdam. Chamber of Commerce. Report for 1898. Translated from the Dutch. Map, 8vo.....................	The Cobden Club
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Chemins de fer publics de la Norvège, 1897-98. (307)	
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Meddelelser fra det Stat. Centralbureau. 16e Bind. 1898	

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Annuario Estatistico das Contribuiçoes directas, 1892-93. Maps. 1898 .... Annuario Estatistico de Portugal. 1892. 8vo. 1899	The Statistical Bureau
Roumania—	
Evaluations des cultures et recoltes en 1898-99. Sheet ...:..	The Statistical Bureau
Russia—	
Agricultural Year-Book, 1899. Parts 2 and 3. (In Russian)	The Department of Agriculture
Bulletin russe de statistique financière et de législation. (Current numbers.) La. 8vo.	The Editor, Bulletin russe
Code Minier. Edition de 1893 . . . 396 pp. 8vo. Paris, 1895	The British War Office Intell. Dept.
Prices of Commodities on the principal Russian and Foreign Markets in 1898. (In Russian.) 4to. 1899 .... Prices of rye and oats in European Russia. Diagram-maps showing. (Current monthly numbers).............	The Department of Trade and Manufactures
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Trade Returns for 1897. (In Russian.) 4to. 1899....	The Department of Customs
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Denombrement de la Population, le 31 Déc., 1895. Diagrams, fol. 1899	The Statistical Bureau
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Arbetsstatistik. II. Undersökning af Tobaksindustrien i Sverige. 8vo. 1899 .... Handels-och Sjöfartskomiten. iv. Skeppsmätningen. 8vo. 1899 .... *Bidrag till Sveriges Officiela Statistik—* I. Telegrafväsendet, 1898. (Telegraphs) .... O. Landtmäteriet, 1898. (Surveys) .... U. Kommunernas Fattigvard och Finanser, 1897. (Poor Relief, &c.) .... V. Bränvins tillverkning, Hvitbetssockertillverkningen, 1897-98. (Beet sugar, &c.) .... General-Sammandrag öfver 1898 års Bevillning ... . Kapital-Konto till Riks- Hufvud- Boken för 1898..... Öfversigt af Sveriges Riksbanks Ställning, 1898. 4to. .... Öfversigt af de enskilda sedelutgifvande bankernas . . . år 1898 .... Riksstat för år 1900. Sm. 4to. 1899............................ Rikets in- och Utförsel. Jan.—June, 1895-99 .... Sammandrag af de enskilda sedelutgifvande bankernas. Jan.—June, 1899 .... Sammandrag af Riksbankens Ställning. Jan.—June, 1899 .... Uppgifter om Hypoteksbanken . . . för 1898. 4to.....	The Central Statistical Committee

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Commerce Suisse. Statistique du. Rapport annuel, 1898. Diagram, 4to.	The Federal Department of Customs
Geneva. Bibliothèque Publique. Compte-rendu pour 1898. 8vo.	The Library
United States—	
Agriculture. Crop Circulars. (Current numbers)........	The Department,
Debt. Monthly Statements of the Public, and of Cash in Treasury. (Current numbers.) Sheets................	The Secretary of the Treasury
Gold, Silver, and Notes, &c., in Circulation. Monthly Statements. (Current numbers.) Sheets	
Index-Catalogue of the Library of the Surgeon-General's Office. 2nd Series. Vol. 4. La. 8vo. 1899	The Surgeon-General, U.S. Army
Labor. 13th Annual Report of Commissioner of Labor, 1898. Hand and Machine Labor. 2 vols.....	The Commissioner of Labor
Rates of Duty on imports into the United States from 1789 to 1890 inclusive, with Statistics relating thereto ... 8vo. 1891	The Cobden Club
Illinois. Bureau of Labor Statistics. 10th Biennial Report, 1898. 8vo.	The Bureau
Kansas. Bureau of Labor and Industrial Statistics. 14th Annual Report, 1898. 8vo................................	The Bureau of Labor
Minnesota. Proceedings of 8th State Conference of Charities and Correction. 1899	The State Board of Charity
New York State. Bureau of Labour Statistics. Bulletin, Nos. 1 and 2, 1899. (Published quarterly)	The Bureau
Boston—	
Receipts and Expenditures of Ordinary Revenue. 1893-97. 4to.	The Department of Municipal Statistics
2nd Annual Report of the Statistics Department for 1898. 8vo.	
Monthly Bulletin of the Statistics Department. May—July, 1899. 4to..	
New York. Public Library. Bulletin. (Current numbers)	The Library
Chicago Astronomical Society. The Earth measured ... and related quantities for Earth, Sun, Moon, and Jupiter. 2nd edition. 40 pp., 8vo. 1899	The Society
Philadelphia Commercial Museum. Siberia : a coming Market. 80 pp., 8vo. 1899..	The Museum
Johns Hopkins University. Studies in Historical and Political Science. Extra vol. Vol. xxi. Cuba and International Relations, a Historical Study in American Diplomacy : *J. M. Callahan.* 503 pp., 8vo. 1899	The University
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Bulletin International des Douanes. (Current numbers.) 8vo.	The Board of Trade

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Agricultural Statistics of British India for 1893-94 to 1897-98. 14th issue. Fol.	Statistical Bureau, Govt. of India
Cultivation of Coffee in India, 1898. 6 pp., fol.	
Financial and Commercial Statistics for British India. [1897-98 and before.] 6th issue. Fol. 1899	
Railways in India. Administration Report for 1897-98. [C–8921.] 1898..	Purchased
East Indian Railway. Diagrams of Traffic audited. 1st half-year of 1899. Fol.	The Company
Sanitary Measures in India. Report on, in 1897-98. Vol. xxxi. [C–9549.] Fol..	The India Office
Statistical Abstract relating to British India from 1888-89 to 1897-98. 33rd No. 1899. [C–9519.]	
Trade of India. Review of, in 1898-99. Diagrams....	Finance & Commerce Department
Bengal. Annual Statement of Sea-borne Trade and Navigation . . . with foreign countries and Indian ports for 1898-99. 2 vols., diagrams. Fol.	The Offg. Collector of Customs
Canada, Dominion of—	
Statistical Year-Book of Canada for 1898. 14th year of issue. 8vo. 1899..	The Statistician, Dept. Agriculture
Agriculture and Colonization. Report of Select Standing Committee on, 1899	Sir J. G. Bourinot, K.C.M.G., LL.D.
Criminal Statistics for year 1897-98	
Insurance. Report of Superintendent of, for 1898	
Marine. Reports of Harbour Commissioners . . . for 1898	
West Huron Election. Report of Committee on Privileges and Elections relative to, 1899	
Banks. Monthly Reports on Chartered. (Current numbers)	Mr. N. S. Garland, F.S.A.
Loan Companies and Building Societies. Report on, for 1898, with Comparative Tables of chief items for 1867 to 1898. 8vo.	
Manitoba. Report on Crops, Live Stock, &c. (No. 59.) 1899	The Department of Agriculture
Ontario. Bureau of Industries. Annual Report for 1897. (Weather and Crops, Live Stock, Values, Rents, and Farm Wages, Chattel Mortgages, Municipal Statistics. Appendix.) Also Bulletin. (No. 70)	The Bureau
Royal Society of Canada. Proceedings and Transactions. Second Series, vol. iv. Plates, 8vo. 1898	The Society
Canada Life Assurance Company. Mortality Experience from 1847 to 1893. Diagrams, 4to. 1895	Mr. Frank Sanderson
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Ceylon Blue Book for 1898 (contains miscellaneous statistics). Fol. .... Papers laid before the Legislative Council of Ceylon during the Session of 1898. Plans, fol.	The Ceylon Government
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Blue Book for the Colony for 1898. Fol.	The Colonial Secretary
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Government Railways and Tramways. Annual Report of Commissioners for year 1898-99. Fol.	Mr. Thomas Hall
Public Works. Report of Department of, for year ended 30th June, 1898. Plates, fol.	The Agent-General for N.S. Wales
Statistical Register for 1898. Parts 8, Agriculture, &c.; 9, Financial Institutions; 10, Law and Crime; 11, Land Settlement; 12, Hospitals and Charities; 13, Miscellaneous... Statistics of the seven Colonies of Australasia, 1861-98. iv + 24 pp. 8vo...	The Government Statistician
Vital Statistics for 1898 and previous years. 8vo. 1899	The Agent-General of N.S. Wales
Wealth and Progress of New South Wales, 1886-87. Map, 8vo. 1887...	Dr. B. W. Ginsburg
New Zealand—	
Government Life Insurance Department. Annual Report of Commissioner, 1898. Fol., 6 pp. .... Labour Department. 8th Annual Report for 1898-99.	The Department
The Student's Flora of New Zealand, by Thomas Kirk. 408 pp., 8vo. 1899	The Government of New Zealand
Queensland—	
Guide to Queensland. 174 pp., map and plates. 8vo. 1899	The Agent-General for Queensland
Statistics of the Colony for 1898. Fol. .... Vital Statistics, 1898. 39th Annual Report by the Registrar-General. Fol. 1899	The Registrar-General of Queensland
South Australia—	
Agricultural and Live Stock Statistics. Preliminary Tables, season 1898-99	The Government Statistician
Straits Settlements—	
The Perak Government Gazette. (Current weekly numbers)	The Government Secretary
Victoria—	
Letters from Victorian Pioneers . . . Edited by T. F. Bride. xiii + 325 pp., 8vo. 1899 .... Public Library, Museums, and National Gallery. Report of Trustees for 1898. 8vo.	The Trustees of the Public Library of Victoria

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(b) India and Colonial Possessions—*Contd.* **Victoria**—*Contd.*	
Statistical Register for 1898. Parts 1, Blue Book. 2, Interchange. 3, Finance. 4, Population (exclusive of Municipal Finances). 5, Vital Statistics. 6, Law, Crime, &c.	The Assistant Government Statist
Royal Society of Victoria. Proceedings. Vol. xi, New Series, Part 2, 1899. Plates	The Society
Western Australia— Financial Statement for year 1899-1900. 20 pp., 8vo. Gold Mining Statistics for 1898. Map, fol. .... Monthly Gold Mining Statistics for Jan.—July, 1899. 7 parts, fol. .... Diagram showing registered output of gold from W. Australia from 1886. Sheet, folded. 1899	The Agent-General for W. Australia
(c) United Kingdom and its several Divisions. **United Kingdom—**	
Board of Trade Journal. (Current monthly numbers)	The Board of Trade
Friendly Societies, Workmen's Compensation Schemes, &c. Reports of Chief Registrar for 1898. Part A. (79.) 1899	The Registrar of Friendly Societies
Foreign Labour Statistics. First annual abstract of, 1898-99. (Wages, Hours of labour, Trade disputes, Co-operative Societies.) [C–9442.] 1899................ Labour. Report on changes in rates of wages and hours of labour in 1898, with statistical tables. [C–9434.] 1899...	The Labour Department
Local Government Board. 28th Annual Report, 1898-99. [C–9444.] Diagrams	The Local Government Board
Mines and Quarries : General Report and Statistics for 1898. Part 3, Output ... [C–9527.] 1899.	The Home Office
Navy Estimates for 1891-92, 1892-93, 1895-96 to 1899-1900. 7 vols., fol...	Dr. B. W. Ginsburg
Public General Acts passed in 62nd and 63rd Victoria, 1899. 8vo.	Purchased
Railway Companies. General Report on share and loan capital. Traffic in Passengers and Goods, &c., for 1898. [C–9457.]	The Board of Trade
Railways in United Kingdom. Summary of Statistics for 1888 and 1894-98. Sheet	Mr. J. Shillito
Statistical Abstract for United Kingdom in each of the last fifteen years from 1884-98. [C–9458.]........	The Board of Trade
Woods, Forests, and Land Revenues. 77th Report of Commissioners of. (257.) 1899	The Commissioners
Finance Accounts for 1898-99. (258.) 1899 .... Inland Revenue. 41st and 42nd Reports of Commissioners of, for years (ended 31st Mar.) 1898 and 1899. 2 vols. .... Liquor Licensing Laws. Final Report of Royal Commission on. [C–9379.] Map. 1899...................... Local Loans Budget. Treasury minute respecting. (166.) 1887 .... Local Loans Fund. Accounts, 1897-98. (146.) 1899.	Purchased

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Great Britain—	
Agriculture. Journal of the Board of. Vol. vi, No. 2, September, 1899	The Board of Agriculture
Agricultural Returns. Statistical Tables showing Acreage under Crops and Grass and number of horses, cattle, sheep, and pigs, 1899. 8vo...............	
Produce of Wheat, Barley, Oats, 1899. Slip, 8vo.	
England and Wales—	
British Museum. Catalogue of Printed Books. (Current numbers.) 4to.	The Trustees
Lunacy (England and Wales). Reports of Commissioners for 1897 and 1898. 2 vols., 8vo.	Purchased
Pauperism (England and Wales). Paupers relieved, 1892-98..	
Poor relief. In-maintenance and out-door relief for half-year ended Lady-Day, 1898	,,
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Reports of Commissioner of Police for 1877 and 1885. 2 parts	The Commissioner of Police
Technical Education Gazette. (Current numbers)	The London County Council
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Leeds. Annual Report of the Medical Officer of Health for 1898 and partly for 1899. 8vo.	,,
Leicester. Abstract of Accounts of the Corporation for 1898-99. 8vo.	The Borough Accountant
Liverpool. Report on Health of Liverpool during 1898. Plans, 8vo.	The Medical Officer of Health
West Hartlepool. Abstract of Accounts, 1898-99, and Report thereon. 8vo..	The Borough Accountant
Wolverhampton. Annual Report upon the health of Wolverhampton for 1898. 8vo.	The Medical Officer of Health

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Bonwick (James)—	
Port Phillip Settlement. 537 pp. Plates, 8vo. 1883	
The lost Tasmanian race. 216 pp., 8vo. 1884............	
Romance of Wool Trade. vi + 472 pp., 8vo. 1894	The Author
Daily life and origin of the Tasmanians. 2nd edition. viii + 304 pp. Plates, 8vo. 1898..............................	
Brown (Nicol) and Turnbull (Charles C.). A Century of Copper. Part 1, Statistics. 29 pp., sm. 4to. 1899	,,
Cooper (Joseph). Tabular Insurance Guides. 1899	The Compiler
Crookes (Sir William). The Wheat Problem . . . with two chapters on future wheat supply of United States, by C. Wood Davis and Hon. John Hyde. xi + 207 pp., 8vo. 1899	Purchased
Gaskell (W. H.). Silver Tables, showing relative equivalents of Bar Silver in London and New York. 106 pp., 8vo. 1893...	Dr. B. W. Ginsburg
Graham (J. C.). Taxation, local and imperial, and local government. 3rd edit. 122 pp., 8vo. 1899	Messrs. P. S. King & Son

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{" *Home Trader.*"] The Home Trade of Manchester [Anon.] ... xvi + 268 pp., 8vo. 1890	Dr. B. W. Ginsburg
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Loria (Achille). The Economic foundations of Society. Translated from second French edition by L. M. Keasbey. xiv + 385 pp., 8vo. 1899	,,
Marzano (Francesco). Il commercio del Vino nei principali Stati del Mondo. Note ad Appunti. Germania. 18 pp., 8vo. Lecce, 1899	The Author
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Muirhead. (Jas. M. P.). Table showing Public Debt and value of Trade per head of Population of certain colonies. Slip. 1899..	The Compiler
Myers (Frederick). A new Bankruptcy Act to supplant the Act of 1883 ... xv + 224 pp., 8vo. Liverpool, 1893	Dr. B. W. Ginsburg
Palgrave (R. H. Inglis). Bank rate in England, France, and Germany, 1844-78. viii + 141 + iv pp., 8vo. 1880	Purchased
Petty (Sir William). Economic Writings of Sir William Petty, with observations upon the Bills of Mortality, more probably by Captain John Graunt. Edited by Charles H. Hull. 2 vols. Plates, &c., 8vo. 1899	The Syndics of the Cambridge University Press
Probyn (L. C.). The Indian Gold Standard. 10 pp., 8vo. 1899	The Author
Sanderson (Frank)— Life Assurance in Canada. 40 pp., diagrams. 1894.... New Mortality Table of Fraternal Societies. The results of its adoption. 8 pp., 4to. 1899	,,
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Williams (Ernest E.). The Case for Protection. viii + 296 pp., 8vo. Diagrams, 1899	,,
Wright (Carroll D.). Outline of Practical Sociology, with special reference to American conditions. xxv + 431 pp. Diagrams, 8vo. New York, 1899	,,
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Popular Fallacies regarding Trade and Foreign Duties, adapted to the present time by E. R. Pearce Edgcumbe. 3rd and 4th editions. 2 vols., 8vo. 1888 and 1893...................................... ....

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A study of small holdings. 98 pp., sm. 8vo. 1893....

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Speeches on questions of Public Policy. Edited by James E. Thorold Rogers. Author's popular edition. xii + 582 pp., sm. 8vo. 1876 ....

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Speeches on questions of Public Policy. Edited by John Bright and James E. Thorold Rogers. 2 vols., 8vo. 1870. Another edition in 1 vol., 1878............

Richard Cobden, notes sur ses voyages, correspond-ances et souvenirs recueillies par Mme. Salis Schwabe ... xvi + 384 pp., 8vo. Paris, 1879 ....

The three panics: an historical episode. 168 pp., sm. 8vo. 1884 ....

The Political writings of Richard Cobden. vii + 704 pp., sm. 8vo. 1886 ....

Cox (*Harold*). Are we ruined by the Germans? 62 pp., 8vo. [1896] ....

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McCarthy (Justin). Sir Robert Peel. viii + 176 pp., portrait, sm. 8vo. 1891...

Mackie (J. B.). The Life and Work of Duncan McLaren. 2 vols., portraits, 8vo. 1888...

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Medley (George W.)—
The German Bogey : a reply to " Made in Germany." viii + 99 pp., sm. 8vo. 1896 ....
Pamphlets and Addresses. viii + 413 pp., sm. 8vo. 1899 ....

Molesworth (William Nassau). History of England from 1830 to 1874. Abridged edition. 608 pp., 8vo. 1877 ....

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History of the Free Trade Movement in England. viii + 188 pp., sm. 8vo. 1881 ....
Wealth Creation. xii + 308 pp., 8vo. 1882 ....
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Morgan (Sampson). How to make the most of the Land. viii + 94 pp., 8vo. 1888 ....

Morley (John). Life of Richard Cobden. 2 vols., portrait, 8vo. 1881. Also edition in 1 vol., 4to. 1882

Nasse (E.). Agricultural community of the middle ages and inclosures of Sixteenth Century in England. Translated from the German by Col. H. A. Ouvry. 100 pp., 8vo. 1871 ....

Playfair (Sir Lyon). Subjects of Social Welfare. 392 pp., 8vo. 1889..

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Rochdale Equitable Pioneers' Society. Catalogue of the Library. Dec., 1868. 8vo. 1869	
Financial Reformer. Vols. 13 and 14. Jan., 1871, to Dec., 1872, inclusive. 1 vol., 4to. 1872..................	
The Radical Programme. With a preface by the Right Hon. J. Chamberlain, M.P. xvi + 263 pp., sm. 8vo. 1885	
(e) Societies, &c. (British).	
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Faculty of Actuaries in Scotland. Catalogue of Library. 8vo. 1899	The Faculty
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Howard Association. Report, October, 1899	The Association
Institute of Chartered Accountants. List of Members, Bye-Laws, &c. 8vo. 1899	The Institute
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St. Bartholomew's Hospital. Statistical Tables of Patients under Treatment during 1898. 8vo.	The Hospital
Scottish Society of Economists. Betterment and Municipal improvements. By John H. Romanes. 14 pp., 8vo. 1899. Also Second Annual Report, &c., 1899	Mr. J. H. Romanes
Society of Accountants and Auditors. List of Members, Articles, Bye-Laws, &c. 8vo. 1899	The Society
Statistical and Social Inquiry Society of Ireland. Journal. Vol. x, Part 79, 8vo. 1899..........................	,,
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(f) Periodicals, &c. (British).	
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(Corrected to 31st December, 1899.)

ROYAL STATISTICAL SOCIETY.

(FOUNDED 1834. INCORPORATED 1887.)

9, ADELPHI TERRACE,
STRAND, W.C., LONDON.

Contents.

ROYAL STATISTICAL SOCIETY,

ROYAL STATISTICAL SOCIETY.

No. 9, ADELPHI TERRACE, STRAND, W.C., LONDON.

NOTICES TO FELLOWS.

December, 1899.

THE Council desire to call the attention of the Fellows to the fact that notwithstanding the change in the name of the Society by the addition of the word "Royal," they are still, in using letters after their names, signifying the membership of the Society, only entitled under Rule 6, to use the letters F.S.S.

ANNUAL Subscriptions are due in advance, on the 1st of January in each year. A Form for authorising a Banker or Agent to pay the Subscription Annually, will be forwarded by the Assistant Secretary, on application. When convenient, this mode of payment is recommended. Drafts should be made payable to the order of "The Royal Statistical Society," and crossed "*Drummond and Co.*"

To be included in the Ballot at any particular Ordinary Meeting, the Nomination Papers of Candidates for Fellowship must be lodged at the Office of the Society at least six days before the date of such Meeting.

FELLOWS who may desire to receive Special and Separate Notices of each Paper to be read before the Society at the Ordinary Meetings, should indicate their wishes to the Assistant Secretary.

THE Ordinary Meetings of the Society during the Session 1899-1900 will be held at 5 p.m., in most cases at **The Society's Rooms**, 9, Adelphi Terrace, W.C.

FELLOWS are entitled to a copy of the Catalogue of the Library and of the Index to the Catalogue. They may be had on personal application at the office, or will be forwarded upon the payment of carriage (9*d*. per parcel post). Fellows residing abroad or in the colonies are requested to send the necessary amount to cover postage, according to postal circumstances. (Weight, 3 lb. 14 oz. and 2 lb. 10 oz. respectively.)

THE Library and the Reading Room are open daily for the use of Fellows from 10 a.m. to 5 p.m., excepting on Saturdays, when they are closed at 2 p.m.

FELLOWS borrowing books from the Library are requested to be good enough to return them with as little delay as possible, but without fail at the expiration of a month, and without waiting for them to be recalled.

FELLOWS changing their Addresses are requested to notify the same to the Assistant Secretary, so that delay or error in forwarding communications, or the *Journal*, may be avoided.

BY ORDER OF THE EXECUTIVE COMMITTEE.

CALENDAR FOR THE SESSION 1899-1900.

1899	MON.	TUES.	WED.	THURS.	FRI.	SATUR.	SUN.	1900	MON.	TUES.	WED.	THURS.	FRI.	SATUR.	SUN.
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	30														

* This Meeting will be held at the Rooms of the Society of Arts.

Particulars of the Papers to be read, and of the time and place of Meeting, will always be found in an advertisement on that page of the "Times" which faces the leading articles, on the Saturday preceding the holding of the Meeting. The advertisement also appears in other London Daily Papers at the same time, and to these announcements the attention of Fellows is particularly directed.

The latest arrangements as to Papers and Meetings up to the time of going to press will be found at page vii in each issue of the *Journal*.

THE ANNUAL GENERAL MEETING

WILL BE HELD ON TUESDAY, THE 19TH JUNE, 1900, AT THE SOCIETY'S ROOMS.

𝔓rogramme of the Session 1899–1900.

ORDINARY MEETINGS

WILL BE HELD

In the Months of November to June,

IN MOST CASES

AT THE SOCIETY'S ROOMS,
9, Adelphi Terrace, Strand, W.C., London.

The Chair will be taken at **5 p.m.** *on the following dates:*—

Tuesday, Nov. 21.	Tuesday, March 20.
,, Dec. 19.	,, April 24.
,, Jan. *16.	,, May 15.
,, Feb. 20.	,, June 19.

See Note on the Opposite Page.

The following Papers have been read (Dec., 1899):—

"Notes on the Food Supply of the United Kingdom, Belgium, France, and Germany." By R. F. Crawford. (Read 21st November.)

"Some Statistics Relating to Working Class Progress since 1860." By G. H. Wood. (Read 19th December.)

The following Papers have been offered; and from these and from others that may yet be offered, a selection will be made by the Council:—

"The International Money Market." By Cornelius Rozenraad. (To be read in January.)

The President's Annual Address. By The Right Hon. Sir H. H. Fowler, G.C.S.I., M.P.

"Comparative Naval Power." By H. W. Wilson.

"On Census Taking and its Limitations." By J. A. Baines, C.S.I. (To be read in March.)

"The Organisation of Local Statistics." By John Macdonell, C.B., LL.D.

"Report as to the Proceedings at the Meeting of the International Statistical Congress at Christiania." By the Delegates.

"A Further Inquiry into the Statistics of the Production and Consumption of Milk and Milk Products in the United Kingdom." By R. Henry Rew.

"Statistics relating to Murder and Capital Punishment, being a continuation of Dr. Guy's Paper in 1875." By Charles H. F. Gordon.

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* This Meeting will be held at the Rooms of the Society of Arts.

ROYAL STATISTICAL SOCIETY,

AN OUTLINE OF ITS OBJECTS.

THE *Royal Statistical Society* was founded, in pursuance of a recommendation of the British Association for the Advancement of Science, on the 15th of March, 1834; its objects being, the careful collection, arrangement, discussion and publication, of facts bearing on and illustrating the complex relations of modern society in its social, economical, and political aspects,—especially facts which can be stated numerically and arranged in tables;—and also, to form a Statistical Library as rapidly as its funds would permit.

The Society from its inception has steadily progressed. It now possesses a valuable Library of over 30,000 volumes, and a Reading Room. Monthly meetings are held from November to June, which are well attended, and cultivate among its Fellows an active spirit of investigation; the Papers read before the Society are, with an abstract of the discussions thereon, published in its *Journal*, which now consists of sixty-two annual volumes, and forms of itself a valuable library of reference.

The Society has originated and statistically conducted many special inquiries on subjects of economic or social interest, of which the results have been published in the *Journal*, or issued separately.

To enable the Society to extend its sphere of useful activity, and accomplish in a yet greater degree the various ends indicated, an increase in its numbers and revenue is desirable. With the desired increase in the number of Fellows, the Society will be enabled to publish standard works on Economic Science and Statistics, especially such as are out of print or scarce, and also greatly extend its collection of Foreign works. Such a well-arranged Library for reference, as would result, does not at present exist in England, and is obviously a great *desideratum*.

The Society is cosmopolitan, and consists of Fellows and Honorary Fellows, forming together a body, at the present time, of about *one thousand* Members.

The Annual Subscription to the Society is *Two Guineas*, and at present there is no entrance fee. Fellows may, on joining the Society, or afterwards, compound for all future Annual Subscriptions by a payment of *Twenty Guineas*.

The Fellows of the Society receive gratuitously a copy of each part of the *Journal* as published Quarterly, and have the privilege of purchasing back numbers at a reduced rate. The Library (reference and circulating), and the Reading Room, are open daily, for the convenience of Members.

Nomination Forms and any further information will be furnished, on application to the *Assistant Secretary*, 9, *Adelphi Terrace, Strand, W.C., London.*

ROYAL STATISTICAL SOCIETY.
LIST OF THE SOCIETY'S PUBLICATIONS.

Note.—Sets—or Copies of any number—of the *Journal*, or of the other Publications of the Society (if not out of print), can be obtained of the publisher, E. Stanford, 26 and 27, Cockspur Street, Charing Cross, London, S.W., or through any bookseller.

	Price.
Proceedings— 308 pp. 1 vol. 8vo. 1834-37	(Out of print)
Transactions— Vol. 1, part 1. 148 pp. 4to. 1837	,,
Journal (published quarterly)— Vols. 1—62. 8vo. 1838-99	5s. each part*
General Analytical Index to Vols. 1—50 of the Journal (1838-87). In 4 parts. 8vo.— (i) For the First Fifteen Volumes (1838-52) (ii) For the Ten Volumes (1853-62)................ (iii) For the Ten Volumes (1863-72)................ (iv) For the Fifteen Volumes (1873-87)	3s. 6d. each part
Subject-Index to the Journal. Vols. xxviii— lvii, 1865-94	1s. 6d.
First Report of a Committee on Beneficent Institutions. I. The Medical Charities of the Metropolis. 68 pp. 8vo. 1857........................	2s. 6d.
Catalogue of the Library— iv + 142 pp. 8vo. 1859...........................	(Out of print)
Statistics of the Farm School System of the Continent (reprinted from the *Journal*, with a Preface and Notes). 63 pp. 8vo. 1878	1s.
Catalogue of the Library— iv + 573 pp. Cloth, super royal 8vo. 1884	10s.
Index to the Catalogue of 1884— i + 372 pp. Cloth, super royal 8vo. 1886	10s.
Jubilee Volume— xv + 372 pp. Cloth, 8vo. 1885........	10s. 6d.
List of Fellows, Rules and Bye-Laws, Regulations of the Library, and Outline of the Objects of the Society, &c. Corrected annually to 31st December. 8vo.	Issued gratuitously

Price of back Numbers of the Journal, &c., to Fellows only.

Fellows only, can obtain sets—or single copies of any number—of the *Journal*, or copies of the other Publications, at the Society's Rooms, 9, Adelphi Terrace, Strand, W.C.

By various resolutions of the Council, the prices charged to Members are as follows :—(a.) back numbers of the *Journal* of the Society, three-fifths of the publishing price; (b.) each part of the General Index to the *Journal*, 2s. 6d.; (c.) the Jubilee Volume, 5s.; (d.) the Subject Index, 1s.

NOTE.—One or two numbers of the *Journal* are now out of print.
* Before 1870 the price varied.

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Of the Royal Statistical Society's Journal.

For the Year 1899.

ROYAL STATISTICAL SOCIETY.

Founded 15*th March*, 1834, *Incorporated* 31*st January*, 1887.

LIST OF THE FORMER

𝔓atron and 𝔓residents of the Society.

𝔓atron.

Period.

HIS ROYAL HIGHNESS THE PRINCE CONSORT, K.G....... 1840–61

𝔓residents.

The Most Noble the Marquis of Lansdowne, K.G., F.R.S. {	1834–36
	1842–43
Sir Charles Lemon, Bart., M.P., LL.D., F.R.S.	1836–38
The Right Hon. the Earl Fitzwilliam, F.R.S..... 1838–40 ;	1847–49
The Right Hon. the Viscount Sandon, M.P.	1840–42
(afterwards Earl of Harrowby.)	
The Right Hon. the Viscount Ashley, M.P.	1843–45
(afterwards Earl of Shaftesbury.)	
The Right Hon. the Lord Monteagle	1845–47
The Right Hon. the Earl of Harrowby, K.G., D.C.L.1849–51 ;	1855–57
The Right Hon. the Lord Overstone	1851–53
The Right Hon. the Earl Fitzwilliam, K.G., F.R.S.	1853–55
The Right Hon. the Lord Stanley, M.P................	1857–59
(afterwards Earl of Derby.)	
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(afterwards Earl Russell.)	
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(afterwards Lord Hampton.)	
Colonel W. H. Sykes, M.P., D.C.L.	1863–65
The Right Hon. the Lord Houghton, D.C.L., F.R.S.	1865–67
The Right Hon. W. E. Gladstone, M.P., D.C.L...........	1867–69
W. Newmarch, F.R.S., Corr. Mem. Inst. of France	1869–71
William Farr, M.D., C.B., D.C.L., F.R.S..	1871–73
William A. Guy, M.B., F.R.S.	1873–75
James Heywood, M.A., F.R.S., F.G.S..................	1875–77
The Right Hon. George Shaw Lefevre, M.P.............	1877–79
Thomas Brassey, M.P.	1879–80
(now the Right Hon. Lord Brassey, K.C.B.)	
The Right Hon. Sir James Caird, K.C.B., F.R.S.	1880–82
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The Right Hon. George J. Goschen, M.P., F.R.S.........	1886–88
T. Graham Balfour, M.D., F.R.S.	1888–90
Frederic J. Mouat, M.D., LL.D., F.R.C.S.	1890–92
Charles Booth, D.Sc., F.R.S.........................	1892–94
The Right Hon. the Lord Farrer......................	1894–96
John Biddulph Martin, M.A., F.Z.S.	1896–97
Alfred Edmund Bateman, C.M.G.	1897
The Right Hon. Leonard H. Courtney, M.A., M.P.	1897–99

LIST OF FELLOWS.

Those marked *c* have Served or are Serving on the Council.

,,   *d* have made Presentations to the Library.

,,   *p* have contributed Papers to the Society.

Those marked thus * *have compounded for their Annual Subscriptions.*

The names of Present Members of Council are printed in SMALL CAPITALS.

Year of Election.		
1888		Ackland, Thomas G., F.I.A., 10, *Church-crescent, Muswell-hill, Highgate, N.*
1888	*c d p*	Acland, The Right Hon. Arthur Herbert Dyke, M.A , M.P., *Westholme, Scarborough.*
1898		Acland, Sir C. Thomas Dyke, Bart., *Killerton, Exeter.*
1892	*c d*	ACWORTH, WILLIAM M., M.A., 18, *St. James's-place, S. W.*
1891		Addington, Right Hon. Lord, 24, *Prince's-gate, S.W.*
1890		Adler, Marcus Nathan, M.A., F.I.A., 1, *Bartholomew-lane, E.C.; and* 22, *Craven-hill, W.*
1884		Agius, Edward Tancred, 3, *Belsize-grove, N.W.*
1886		Ailesbury, The Most Hon. The Marquess of, *Savernake, Wilts.*
1879		Akers-Douglas, The Right Hon. Aretas, M.P., J.P., *Chilston-park, Maidstone, Kent.*
1876		Aldwinckle, Thomas Williams, 1, *Victoria-street, S.W.*
1898		Alexander, Alfred J., *Bristol Waterworks Company, Bristol.*
1896	*d*	Allan, Francis John, M.D., 5, *Tavistock-street, Strand, W.C.*
1887	*d*	Allard, Alphonse (*Hon. Director of Belgian Mint*), 52, *Avenue Louise, Brussels, Belgium.*

Year of Election.		
1889		Allen Frank, J.P., *37, Murphy-street, Wellington, N.Z.*
1896		Allen, George Berney, *Cawnpore, N.W.P., India; and 13, Prince's-gardens, S.W.*
1876		Allen, John T. R., *10, Norfolk-square, Brighton.*
1899	*d*	Allen, Richard James, *Cotton Assocn., Ltd., St. Mary's-gate, Manchester.*
1898		Allen, William Henry, *1, Dean's-yard, Westminster Abbey, S.W.*
1893		Anderson, Herbert William, *Halling, Kent.*
1889		Anderson, John Andrew (Alderman), *Faversham, Kent.*
1886		Andras, Henry Walsingham, F.I.A., *25, Pall Mall, S.W.*
1871		Angus, R. B., *Montreal, Canada.*
1890		Ann, Alfred E., F.R.G.S., *The Oaks, Snaresbrook, Essex.*
1897		Anning, Edward Herbert, F.R.G.S., *78, Cheapside, E.C.*
1884		Anning, Edward James, *78, Cheapside, E.C.*
1895		Arbuthnot, Gerald Archibald, *52, Eaton-place; and 4, Whitehall-place, S.W.*
1872		*Archibald, William Frederick A., M.A., *4, Brick-court, Temple, E.C.*
1892		Argyle, Jesse, *67, Mildmay-park, N.*
1897		Arnold, William, *11, Albion-street, Hanley, Staffs.*
1888		Asch, William, *4, Albert Mansions, 118, Victoria-street, S.W.*
1888	*d*	Atkinson, Charles, *61, Margravine-gardens, West Kensington, W.*
1893	*d p*	Atkinson, Frederick J., *Deputy Accountant General, Calcutta, India.*
1871		Atkinson, George W., *13, Regent-street, Barnsley.*
1892		*Atkinson, Robert Hope, *New York Life Insurance Co., Place d'Armes, Montreal.*
1893		Aves, Ernest, M.A., *18, Primrose-hill-road, N.W.*

Year of Election.		
1872	c d	*Babbage, Major-General Henry Prevost, *Mayfield, Lansdown, Cheltenham.*
1872		*Backhouse, Edmund, *Trebah, Falmouth.*
1892		Bacon, George Washington, F.R.G.S., 127, *Strand, W.C.*
1855	c d	BAILEY, ARTHUR HUTCHESON, F.I.A., 26, *Mount Ephraim-road, Streatham, S.W.*
1890		Bain, William Whyte, *Loch Goil, Sunderland-road, Forest-hill, S.E.*
1881	c d p	BAINES, JERVOISE A., C.S.I., (*Hon. Secretary*), 23, *Kensington Park-gardens, W.*
1887		Baldwin, Alfred, M.P., J.P., *Wilden House, near Stourport.*
1878		Balfour, The Right Hon. Arthur J., M.P., F.R.S., 10, *Downing-street, S.W.*
1886		Balfour, The Right Hon. Gerald William, M.P., 24, *Addison-road, Kensington, W.*
1881		*Barfoot-Saunt, William Henry, *Market Harborough, Leicestershire.*
1884		Barlow, William Henry, F.R.S., C.E., *High Combe, Old Charlton, Kent.*
1899		*Barnardo, Thomas John, F.R.C.S., Edin., *St. Leonard's Lodge, Surbiton.*
1887		Barnes, Joseph Howard, F.I.A., 70, *Lombard-street, E.C.*
1885		Barratt, Thomas J., 75, *New Oxford-street, W.*
1887		*Barrett, Thomas Squire, F.Z.S., M.A.I., &c., *Heswall-park West, Heswall, Chester.*
1878		Barry, Sir Francis Tress, Bart., M.P., *St. Leonard's-hill, Windsor.*
1888		*Bartlett, Frederick W., 17, *Melford-road, Dulwich Common, S.E.*
1889	d	Bastable, Professor C. F., M.A., LL.D., 6, *Trevelyan-trr., Brighton-rd, Rathgar, Co. Dublin.*
1873		Bate, George,
1877	c d p	BATEMAN, ALFRED EDMUND, C.M.G. (*Honorary. Vice-President*), *Board of Trade, Whitehall-gardens, S.W.*
1888		Batten, John W., Q.C., 3, *Harcourt-buildings, Temple, E.C.*

Year of Election.		
1877		Bayfield, Arthur, 95, *Colmore-row, Birmingham.*
1873		*Baynes, Alfred Henry, F.R.G.S., 19, *Furnival-street, Holborn, E.C.*
1871		*Baynes, William Wilberforce, F.I.A., *Pickhurst Wood, Bromley, Kent.*
1875	*d*	*Beardsall, Francis E. M., 63, *Brown-street, Manchester.*
1875	*d*	*Beaufort, William Morris, F.R.A.S., F.R.G.S., 18, *Piccadilly, W.*
1882	*d*	*Beazeley, Michael Wornum, M.A., 31, *Bishwood-road, Kew.*
1884		Bedford, James, *Woodhouse Cliff, Leeds.*
1882	*c*	*Beeton, Henry Ramie (6a, *Austin Friars, E.C.*), 9, *Maresfield-gardens, Hampstead, N.W.*
1899	*d*	Beeton, Mayson M., *Horsey Hall, Norfolk.*
1886	*d*	Begg, Ferdinand Faithfull, M.P., *Bartholomew House, E.C.*
1890		Bell, Frederick, F.I.A., *Imperial Life Office*, 1, *Old Broad-street, E.C.*
1892		Bell, Frederick William, *P.O. Box* 916, *Johannesburg, S. Africa.*
1884	*d*	Bell, James T., *Northcote, Dowanhill, viâ Glasgow*
1897		Bennett, William, *City Mutual Life Ass. Soc., Melbourne.*
1888		*Benson, Godfrey R., 23, *The Grove, Boltons, S.W.*
1895		Bentinck, Lord Henry, M.P., 13, *Grosvenor-place, S.W.*
1884		*Bentley, Richard, F.R.G.S., *Upton, Slough, Bucks.*
1884	*d*	Berg, Wilhelm, 21, *Mincing-lane, E.C.*
1890		Berry, Arthur, M.A., *King's College, Cambridge.*
1891		Berry, Oscar, C.C., F.C.A., *Monument House, Monument-square, E.C.*
1875		Bevan, Thomas, *Stone-park, near Dartford, Kent.*
1869	*p*	*Beverley, The Hon. Mr. Justice Henry, *Nascot Lodge, Watford.*
1891	*d*	Biddle, Daniel, M.R.C.S., L.S.A., *Charlton Lodge, Kingston-on-Thames.*
1897		Biggs, John Thomas, J.P., *Woodlands, Aylestone, Leicester.*
1888		Billinghurst, Henry F., 35, *Granville-park, Blackheath, S.E.*

Year of Election.		
1899		Birchenough, Henry, M.A., *Macclesfield.*
1892		*Birkmyre, William, *Reform Club Chambers, Pall Mall, S.W.*
1881		Bishop, George, 113, *Powis-street, Woolwich.*
1898		Blount, Edward Thomas Joseph, F.F.A., *Standard Insurance Co., 3, Pall Mall East, S.W.*
1898		*Blyth, Sir James, Bart., *Stansted, Essex.*
1884	*d*	Boileau, John Peter H., M.D., &c. (*Brigade-Surgeon Lieut.-Col.*), *Trowbridge, Wilts.*
1881		Bolitho, Thomas Robins, *Trengwainton, Hea Moor, R.S.O., Cornwall.*
1887		Bolling, Francis, 2, *Laurence Pountney-hill, E.C.*
1890		Bolton, Edward, J.P., *Clifton House, Beverley-road, Hull.*
1880		Bolton, Joseph Cheney, *Carbrook, Larbert, Stirlingshire.*
1885	*c d*	*Bonar, James, M.A., LL.D., *Civil Service Commission, Westminster, S.W.*
1887		Bond, Edward, M.P., *Elm Bank, Hampstead, N.W.*
1898		Bone, Albert Ebenezer, *Knutsford House, Larkhall-lane, Clapham, S.W*
1894		Bonnett, Alfred, 10, *City-road, E.C.*
1885	*c d p*	Booth, Charles, D.Sc., F.R.S. (*Hon. Vice-President*), 2, *Talbot-court, Gracechurch-street, E.C.*
1888		Bottomley, George, *Arbourfield House, Derby.*
1899		Bourne, Arthur (*Equitable Life Office*), 120, *Broadway, New York, U.S.A.*
1876	*c*	Bowen, Horace George, *Bank of England, E.C.*
1894	*c d p*	Bowley, Arthur Lyon, M.A., 96, *The Grove, Ealing.*
1879		Bowley, Edwin, F.I.A., 78, *South Hill-park, Hampstead.*
1886	*c d*	Boyle, Sir Courtenay, K.C.B. *Board of Trade, Whitehall-gardens, S.W.*
1894	*c d p*	Brabrook, Edward William, C.B., F.S.A., 28, *Abingdon-street, S.W.*
1883		Braby, Frederick, F.C.S., F.G.S., *Bushey Lodge, Teddington.*
1875		Braby, James, J.P., *Maybanks, Rudgwick, Sussex.*

Year of Election.		
1888	d	Bramwell, Sir Frederick J., Bart., D.C.L., F.R.S., 5, *Great George-street, Westminster, S.W.*
1873	c d p	BRASSEY, HIS EXCELLENCY THE RIGHT HON. LORD, K.C.B. (*Honorary Vice-President*), *Government House, Melbourne; 4, Great George-street, S.W.; and 24, Park-lane, W.*
1864		*Braye, The Right Hon. Lord, *Stanford Hall, Market Harbro'; and 7, Buckingham-gate, S.W.*
1899	d	Broemel, Percy Rudolph, *Consulate - General for Austria - Hungary, 22, Laurence Pountney-lane, E.C.*
1883		Brooke, C. B., 16, *Leadenhall-street, E.C.*
1874		Broom, Andrew, A.C.A., *Eaglehurst, Staines, Middlesex.*
1895	d	Broomhall, George James Short, 17, *Goree Piazzas, Liverpool.*
1878		Brown, Alexander Hargreaves, M.P., 12, *Grosvenor-gardens, S.W.*
1896		*Brown, Daniel Maclaren, junr., *P.O. Box 187, Corra Linn, Port Elizabeth, S.A.*
1893		Brown, James William Bray, F.S.A.A., *Corporation-street, Birmingham; and Moseley, Worcestershire.*
1890		Browne, Edward William, 33, *Poultry, E.C.*
1875	p	Browne, Thomas Gillespie C., F.I.A., 11, *Lombard-street, E.C.*
1886		*Brunner, Sir John Tomlinson, Bart., M.P., *Druid's Cross, Wavertree, Liverpool.*
1880	c d p	*BURDETT, SIR HENRY CHARLES, K.C.B., *The Lodge, Porchester-square, W.*
1873		*Burdett-Coutts, The Right Hon. the Baroness, 1, *Stratton-street, W.; and Holly Lodge, Highgate, N.*
1884		Burdett-Coutts, William, M.P., 1, *Stratton-street, Piccadilly, W.*
1897		Burke, David, A.I.A., F.I. Inst., *Royal Victoria Life Ins. Co., Montreal, Canada.*
1895		Burrup, John Arthur Evans, *c/o H. S. King & Co., 65, Cornhill, E.C.*
1880		Burt, Frederick, F.R.G.S., *Uplands, Stoke Poges, near Slough, Bucks.*
1872		*Burton, The Right Hon. Lord, *Chesterfield House, Mayfair, W.; and Rangemore, Burton-on-Trent.*
1898		Burton, William Roland, *c/o Colonial Mutual Life Ass. Soc., Cape Town.*

Year of Election.		
1886		Bush, Baron William de, F.C.S.,
		Preshaw House, near Bishop's Waltham, Hants.
1893	*d*	*Bushill, Thomas William,
		Longfield, Bubbenhall, viâ Kenilworth.
1892		Byworth, Charles Joseph, J.P., F.S.A.A. (*Town Clerk*),
		Town House, Cape Town, South Africa.
1897		Cairnes, Frederick Evelyn,
		Worsley, Manchester.
1896		Campbell, Charles William,
		H.B.M. Consulate General, Shanghai, China.
1879		Campbell-Colquhoun, Rev. John Erskine,
		Chartwell, Westerham, Kent.
1889	*p*	Cannan, Edwin, M.A,,
		1, *Wellington-square, Oxford.*
1891	*d*	Cannon, Henry W. (*Chase National Bank*),
		15, *Nassau-street, New York, U.S.A*
1881		Carden, Lionel Edward Gresley,
		H.M. Consul, Mexico.
1872		*Carillon, J. Wilson, F.S.A., F.R.G.S.,
		The Chimes, Richmond, Surrey.
1893		*Carpenter, Henry Saunders,
		Beckington House, Weighton-road, Anerley, S.E.
1888		Carr, Ebenezer,
		24, *Coleman-street, Bank, E.C.*
1893		Carr, William Robert Taylor,
		Monument House, Monument-square, E.C.
1890		*Carter, Eric Mackay, A.I.A., F.C.A.,
		33, *Waterloo-street, Birmingham.*
1883	*d*	*Carter, Joseph Robert,
		67, *Cromwell-avenue, Highgate, N.*
1878		*Casley, Reginald Kennedy, M.D.,
		Ipswich.
1881		Causton, Richard Knight, M.P.,
		12, *Devonshire-place, Portland-place, W.*
1884	*d*	*Chailley-Bert, Joseph,
		44, *Chaussée d'Antin, Paris.*
1880		*Chamberlain, The Right. Hon. Joseph, M.P., F.R.S.,
		40, *Prince's-gardens, S.W.*

Year of Election.		
1898		Chapman, Edward Stuart, *22, Franconia-road, Clapham-common, S.W.*
1886	*d*	*Chapman, Samuel, F.I.Inst., *Calle Real, 1, Coyoacan, Mexico, D.F.*
1892		*Chatham, James, F.I.A., F.F.A., *Inverleith Park House, Edinburgh.*
1851		*Cheshire, Edward, *3, Vanbrugh-park, Blackheath, S.E.*
1886	*d p*	*Chisholm, George Goudie, M.A., B.Sc., F.R.G.S., *59, Drakefield-road, Upper Tooting.*
1888		Clarke, C. Goddard, J.P., *Fairlawn, 157, Peckham Rye, S.E.*
1882	*d*	*Clarke, Sir Ernest, M.A., F.L.S., F.S.A., *13a, Hanover-square, W.*
1877		*Clarke, Henry, L.R.C.P., *H.M. Prison, Wakefield, Yorks.*
1890		Clarke, Henry, J.P., *Cannon Hall, Hampstead, N.W.*
1899		Claughton, Gilbert H., *The Priory, Dudley.*
1899		Clay, Walter Gorst, M.A., *5, Paper-buildings, Temple, E.C.*
1869	*c*	Cleghorn, John, *3, Spring-gardens, S.W.*
1853		Clirehugh, William Palin, F.I.A., *66, Cornhill, E.C.*
1889		Coate, James, *Lea Coombe House, Axminster.*
1873		Cockle, Major George, F.R.G.S., *9, Bolton-gardens, South Kensington, S.W.*
1884		Cockshott, John James, *24, Queen's-road, Southport.*
1887	*c*	COHEN, NATHANIEL LOUIS, *Englefield Green, Staines and 3, Devonshire- place, Portland-place, W.*
1888		Coleman, Harry, *34, Golden-square, W.*
1859		Coles, John, F.I.A., *39, Throgmorton-street, E.C.*
1899		Colescu, Leonida, D.Sc., *Chef du Service de la Statistique Générale, Ministère de l'Agriculture, Bucharest.*
1892	*p*	*Collet, Miss Clara Elizabeth, M.A., *36, Berkeley-road, Crouch End, N.*
1887		Collet, Sir Mark Wilks, Bart., *2, Sussex-square, W.; and St. Clere, Sevenoaks.*
1895		Collins, Howard James, *The General Hospital, Birmingham.*
1882		*Collum, Rev. Hugh Robert, M.R.I.A., F.R.C.I., *Leigh Vicarage, near Tonbridge, Kent.*

B

Year of Election.		
1891	d	Cooper, Joseph, 60, *Park-street, Farnworth, near Bolton.*
1874		Corbett, John, *Impney, Droitwich.*
1883		Corgialegno, M., *George-yard, Lombard-street, E.C.*
1873		Cork, Nathaniel, F.R.G.S., 18, *Birchin-lane, E.C.*
1889		Cornwallis, Fiennes Stanley Wykeham, M.P., *Linton-park, Maidstone, Kent.*
1895		Costello, James Edward, 3, *Throgmorton-avenue, E.C.*
1880	d	Cotterell-Tupp, Alfred, 17, *Devonshire-terrace, Hyde-park, W.*
1899		Court, Stephen E., 17, *Pall Mall East, S.W.*
1862	c d p	COURTNEY, THE RIGHT HON. LEONARD HENRY, M.A., M.P. (*Honorary Vice-President*), 15, *Cheyne Walk, Chelsea, S.W.*
1896	d	Cox, Harold, 6, *Raymond-buildings, Gray's Inn, W.C.*
1888		Craggs, John George, C.A., 75, *Cornwall Gardens, Queen's Gate, S.W.*
1874	c d p	CRAIGIE, MAJOR PATRICK GEORGE (*Vice-President and Hon. Foreign Secretary*), 6, *Lyndhurst-road, Hampstead; and 4, White-hall-place, S.W.*
1899		Craik, Sir Henry, K.C.B., LL.D., *Scotch Education Department, Dover House, Whitehall, S.W.*
1890	c d p	CRAWFORD, RICHARD FREDERICK, 4, *Whitehall-place, S.W.*
1891		*Crawley, Charles Edward (*Controller General*), *Hyderabad, Deccan, India.*
1894		Crease, Major-General John Frederick, C.B., *United Service Club, Pall Mall, S.W.*
1878		Crewdson, Ernest, *Castle Meadows, Kendal.*
1892		Cripps, Charles Alfred, Q.C., M.P., 1, *Essex-court, Temple, E.C.*
1890		Croal, David Octavius, 11, *Abchurch-lane, E.C.*
1883	c d	Cunningham, Rev. William, M.A., D.D., 2, *St. Paul's-road, Cambridge.*
1879	d	Curtis, Robert Leabon, F.S.I., J.P., 120, *London Wall. E.C.*
1873		Czarnikow, Cæsar, 29, *Mincing-lane, E.C.*

Year of Election.		
1886		Dale, Sir David, Bart., *West Lodge, Darlington.*
1888		Dangerfield, Athelstan, A.C.A., *56, Cannon-street, E.C.*
1898	*d*	*Danson, Francis Chatillon, *Liverpool and London Chambers, Liverpool.*
1880	*c d p*	Danvers, Frederick Charles, *Hazledene, Crockford Park-road, Addlestone.*
1873	*c d p*	Danvers, Sir Juland, K.C.S.I., *103, Lexham-gardens, Kensington, W.*
1897	*d p*	*Darwin, Major Leonard, R.E., F.R.G.S., *12, Egerton-place, S.W.*
1892		Dash, William Lawson, J.P., *301, Pitt-street, Sydney, N.S.W.*
1893		Davidson, Captain J. H. D., *Box 1463, G.P.O., Sydney, N.S.W.*
1869		Davies, James Mair, *168, St. Vincent-street, Glasgow.*
1896		Davies, Theodore Llewelyn, *The Treasury, Whitehall, S.W.*
1899		D'Avigdor-Goldsmid, Osmond Elim, *Somerhill, Tonbridge, Kent.*
1888		Dawson, G. J. Crosbie, M. Inst. C.E., F.G.S., *North Staffordshire Railway, Stoke-upon-Trent.*
1899		Dawson, Miles Menander, *11, Broadway, New York, U.S.A.*
1899	*d*	Dawson, Sidney Stanley, A.C.A., *35, Dale-street, Liverpool.*
1897	*d*	Deane, Albert Bickerton, *35, Great George-street, Westminster, S.W.*
1880		Debenham, Frank, *1, Fitzjohn's-avenue, Hampstead, N.W.*
1885	*d*	De Broë, Emile Conrad De Bichin, *41, Belsize-avenue, N.W.*
1879		*De Ferrieres, The Baron Du Bois, J.P., *Bay's Hill House, Cheltenham.*
1898		Defries, Wolf, B.A., *Arden, Portmore-park, Weybridge.*
1891		Denne, William, *Phillimore, Wetherill-road, New Southgate, N.*
1898	*d*	Denny, John Thavies, *42, Devonport-road, Shepherd's Bush, W.*
1873		Dent, Edward, *2, Carlos-place, Grosvenor-square, W.*
1887		Dent, George Middlewood, *13, Chambres-road, Southport.*

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Year of Election.		
1889		De Rothschild, Leopold, J.P., D.L. (Alderman),
		5, *Hamilton-place, Piccadilly, W.*
1892		De Smidt, Henry (*Permanent Under-Secretary*),
		Cape Town, Cape Colony.
1898		Dever-Summers, Frank,
		39, *Harvey-road, Blackheath, S.E.; and*
		National Liberal Club, S.W.
1892		Dewar, William Nimmo (*Citizens' Life Assurance Co.*),
		21, *Castlereagh-street, Sydney, N.S.W.*
1890		Dickinson, Willoughby Hyett,
		51, *Campden-hill-road, W.*
1866	c d p	*Dilke, The Right Hon. Sir Charles Wentworth, Bart.,
		M.P., LL.M.,
		76, *Sloane-street, S.W.*
1897		Dobson, Goland Burton,
		58, *Lincoln's Inn Fields, W.C.*
1889		Double, Alfred, C.C.,
		92 *and* 93, *Fore-street, E.C.*
1889		Doubleday, William Bennett,
		123, *Tulse-hill, S.W.*
1899		Dougharty, Harold,
		London and Lancs. Life Office, 66 *and* 67,
		Cornhill, E.C.
1889	d	Douglas, J.,
		E.I. Railway House, Dalhousie Square, Calcutta.
1878	d	Doyle, Patrick, C.E., F.G.S., M.R.A.S.,
		Calcutta.
1894	c d p	Drage, Geoffrey, M.A., M.P.,
		15, *Wilton-place, S.W.*
1890		Drummond, Charles James,
		21, *Dalmore-road, West Dulwich, S.E.*
1897	d	Dudfield, Reginald, M.A., M.B.,
		19, *Blomfield-road, Maida Vale, W.*
1895	c	DUDLEY, THE RIGHT HON. THE EARL OF,
		Board of Trade, Whitehall Gardens, S.W.
1875	d p	Dun, John,
		Parr's Bank, Bartholomew-lane, E.C.
1878	c	*Dunraven, The Right Hon. the Earl of, K.P.,
		Kenry House, Putney Vale, S.W.
1885		Dyer, William John,
		17, *Montpelier-row, Blackheath, S.E.*

Year of Election.		
1888		Earnshaw, Jacob, *Prudential Assurance Buildings*, 78, *King-street, Manchester.*
1888	*d*	Eckersley, J. C., M.A., F.R.G.S., *Ashfield, Wigan.*
1883	*c d p*	EDGEWORTH, PROFESSOR FRANCIS YSIDRO, M.A., D.C.L., 5, *Mount Vernon, Hampstead; and All Souls', Oxford.*
1896		Edwards, Charles Lewis, 748, *Avenida de Mayo, Buenos Aires.*
1880		Egerton of Tatton, The Right Hon. Earl, 7, *St. James's-square, S.W.*
1885	*c d p*	Elliott, Thomas Henry, C.B., *Board of Agriculture,* 4, *Whitehall-place, S.W.*
1885		Elliott, William, *P.O. Box* 42, *Lower St. George's-st., Cape Town.*
1895		Elliott, William, junr., *P.O. Box* 1583, *Johannesburg, South Africa.*
1895		Elwell, William Henry, 38, *Parliament-street, S.W.*
1889		Erhardt, William, 7, *Bury-street, Bloomsbury, W.C.*
1896		Everett, Percy Wynn, *Elstree, Herts.*
1892		Faber, Harald, *Fiona, Lennard-road, Penge, S.E.*
1875		Faraday, Frederick J., 17, *Brazennose-street, Manchester.*
1888		Farlow, A. R. King, 4, *King-street, Cheapside, E.C.*
1889	*d*	Farnworth, Edward James, 26, *Winckley-square, Preston.*
1878		Farren, George, J.P., M.Inst.C.E., *Carnarvon.*
1890		Faulks, Joseph Ernest, B.A., F.I.A., 187, *Fleet-street, E.C.*
1893		*Fawcett, Mrs. Millicent Garrett, 2, *Gower-street, W.C.*
1882		Fell, Arthur, M.A., 46, *Queen Victoria-street, E.C.*

Year of Election.		
1894		Fellows, Rowland Hill, F.I.A.,
		32, *Honiton-road, Kilburn, N.W.*
1893		Fenwick, John Fenwick,
		Spencer House, Wimbledon-common.
1894		Field, John William (*Gas Light and Coke Company*),
		Horseferry-road, Westminster, S.W.
1899		Finch, Henry Hobson,
		29, *Kensington Gardens-square, S.W.*
1880		Finlaison, Alexander John, C.B., F.I.A.,
		19, *Old Jewry, E.C.*
1889		*Finlay, Major Alexander,
		The Manor House, Little Brickhill, Bletchley, Bucks.
1884	*d*	*Finnemore, The Hon. Mr. Justice R. I., F.R.G.S.,
		Supreme Court, Pietermaritzburg, Natal, South Africa.
1892		Fisher, George, J.P., M.H.R. (*Chevalier of the Order of Crown of Italy*),
		Hill-street, Wellington, New Zealand.
1888		Fisher, Walter Newton, F.C.A.,
		4, *Waterloo-street, Birmingham.*
1898		Fisk, George William Victor,
		142, *Holborn-bars, E.C.*
1885		*Fitz-Gerald, Lt.-Col. Wm. G., M.A., F.R.Hist.S., F.R.S.L.,
		Conneragh, Youghal, Ireland.
1896		Fletcher, Benton,
		44, *Bankside, Southwark, S.E.*
1893	*d p*	*Flux, Professor Alfred William, M.A. (*Owen's College, Manchester*),
		57, *Parsonage-road, Withington, Manchester.*
1882		Foley, Patrick James (*Pearl Insurance Company*),
		Adelaide-place, London Bridge, E.C.
1896	*d*	Folkmar, Professor Daniel,
		University of Chicago, Ill., U.S.A.
1889		Foot, Alfred,
		Thurles, 35, Thornhill-road, Croydon.
1898	*d*	Forster, John Walter,
		3, *Ossington-villas, Nottingham.*
1841	*c*	Fortescue, The Right Hon. Earl,
		Castle Hill, South Molton, Devon.
1893		Fortune, David, J.P.,
		84, *Wilson-street, Glasgow; and* 19, *Rowallan-gardens, Partick, Glasgow.*
1884		Fosbery, William Thomas Exham,
		The Castle-park, Warwick.
1897		Fountain, H.,
		44, *Parliament-street, S.W.*

Year of Election.		
1899	*c*	FOWLER, THE RIGHT HON. SIR HENRY HARTLEY, G.C.S.I., M.P. (*President*), 9, *Clements-lane, E.C.;* and 32, *Princes' Gate, S.W.*
1868	*c*	Fowler, William, 43, *Grosvenor-square, W.*
1893		Fox, Stephen Newcome, 12, *Cromwell-crescent, South Kensington, S.W.*
1878	*c d*	Foxwell, Professor H. Somerton, M.A., *St. John's College, Cambridge.*
1894		Francis, Joseph, 10, *Finsbury-square, E.C.*
1887		Frankland, Frederick William, F.I.A., *New York Life Office*, 346, *Broadway, New York.*
1899		Franklin, Arthur Ellis, 21, *Cornhill, E.C.*
1886	*d*	Fream, Professor William, B.Sc., Lond., LL.D., F.L.S., F.G.S., *The Vinery, Downton, Salisbury.*
1887		Freeman, T. Kyffin, F.G.S., 35, *Whitehall-park, N.*
1890		Freestone, John, *Sutton-in-Ashfield, Nottingham*
1886		Fuller, George Pargiter, *Neston-park, Corsham, Wilts.*
1878		Fuller, William Palmer, 2, *Verulam-buildings, Gray's Inn, W.C.*
1852		Galsworthy, Sir Edwin Henry, J.P., 26, *Sussex-place, Regent's-park, N.W.*
1860	*c d p*	Galton, Francis, F.R.S., F.R.G.S., 42, *Rutland-gate, S.W.*
1887		Garcke, Emile, *Donington House, Norfolk-street, Strand, W.C.*
1889	*d*	Garland, Nicholas Surrey, *Finance Department, Ottawa, Canada.*
1899		Garnon, Edward William, 63, *Moorgate-street, E.C.*
1895		Garvan, John Joseph, *Citizen's Life Assurance Co., Sydney, N.S.W.*
1880		*Gates, John Benjamin, A.C.A., 47, *Warwick-street, Regent-street, W.*
1899		Gelling, Benjamin Richard, *lLife Assn. of Australasia, 5, Lothbury, E.C.*

Year of Election.		
1896		Gerlich, Hermann Gustav, Dr. Jur.,
		70, *Avonmore-road, West Kensington, W.*
1885		Gibb, George S.,
		North-Eastern Railway Company, York.
1871		Gibbs, George Sleight,
		3, *Vane-terrace, Darlington.*
1889	*d*	Gibson, George Rutledge,
		55, *Broadway, New York City, U.S.A.*
1867	*c d p*	*GIFFEN, SIR ROBERT, K.C.B., LL.D., F.R.S.
		(*Honorary Vice-President*),
		9, *Bina-gardens, South Kensington, S.W.*
1877		Gilbert, William H. Sainsbury,
		70, *Queen-street, Cheapside, E.C.*
1878		*Glanville, Silvanus Goring,
		Lloyd's, E.C.
1860	*c p*	GLOVER, JOHN, J.P.,
		88, *Bishopsgate-street Within, E.C.*
1888		Goad, Charles E., M. Am. and Can. Soc. C.E.,
		53, *New Broad-st., E.C.; and Montreal, Canada.*
1897	*d p*	Gomme, George Laurence, F.S.A.,
		24, *Dorset-square, Marylebone, N.W.*
1884	*d*	*Gonner, Professor Edward C. K., M.A.,
		University College, Liverpool.
1885		Goodsall, David Henry, F.R.C.S.,
		17, *Devonshire-place, W.*
1892		Goodwin, Alfred, M.A.,
		2, *Charles-road, St. Leonards, Sussex.*
1899		Gordon, Charles H. F.,
		2, *The Mall, Brentford, Middlesex.*
1868	*c p*	GOSCHEN, THE RIGHT HON. GEORGE JOACHIM, M.P.
		(*Honorary Vice-President*),
		Admiralty House, Whitehall, S.W.; and Seacox-
		heath, Hawkhurst.
1855		*Gosset, John Jackson,
		Thames Ditton, Surrey.
1899		Gouge, Herbert Dillon,
		Public Actuary's Office, Adelaide, S.A.
1885		Goulding, William Purdham, F.S.I.,
		41, *Moorgate-st., E.C.; and* 18, *Mercers-rd., N.*
1887		Gover, Frederic Field,
		10, *Lee-park, Blackheath, S.E.*
1893		*Gray, The Hon. James McLaren, M.A., F.R.G.S.,
		6, *Albemarle-street, Piccadilly, W.*
1895	*d*	Green, John Little,
		Langholm, Embleton-road, Lewisham, S.E.
1888		Green, Joseph Shaw,
		18, *King-street, Warrington.*
1895		Gretton, John, M.P.,
		Burton-on-Trent.

Year of Election.		
1887		Gribble, George J.,
		Henlam Grange, Biggleswade.
1883		Griffin, Josiah,
		Vanbrugh-park, Blackheath, S.E.
1868		Griffith, Edward Clifton,
		Reliance Office, 71, King William-street, E.C.
1883	*d*	Grimshaw, Thomas Wrigley, C.B., M.D., M.A.,
		(*Registrar-General of Ireland*),
		Priorsland, Carrickmines, Co. Dublin.
1878		Guthrie, Charles, F.C.A.,
		London Bank of Australia, Melbourne, Victoria.
1885	*d*	Guthrie, Edwin,
		Victoria-park, Manchester.
1887	*d*	Guyot, Yves (*Deputé*),
		95, Rue de Seine, Paris.
1880		*Gwynne, James Eglinton A., J.P., F.S.A.,
		Folkington Manor, Polegate, Sussex.
1887		Gwyther, John Howard,
		34, Belsize-park-gardens, N.W.
1892	*d*	Hadfield, Robert A.,
		Fairfield, Sheffield.
1873	*d*	*Haggard, Frederick T.,
		1, Broadwater Down, Tunbridge Wells.
1887		Haldeman, Donald Carmichael,
		Mutual Life Insurance Co. of New York.
		17 & 18, Cornhill, E.C.
1883		Hall, Sir John, K.C.M.G.,
		Hororata, Canterbury, New Zealand.
1897	*d*	Hall, Thomas,
		Railway Commissioners' Offices, Sydney, N.S.W.
1878		Hallett, Thomas George Palmer, M.A.,
		Claverton Lodge, Bath.
1887	*d*	Hamilton, Sir Edward W., K.C.B.,
		The Treasury, Whitehall, S.W.
1873	*c p*	Hamilton, The Right Hon. Lord George Francis, M.P.
		17, Montagu-street, Portman-square, W.
1884		*Hammersley, Hugh Greenwood,
		14, Chester-square, S.W.
1885		*Hancock, Charles, M.A.,
		2, Cloisters,Temple, E.C.; and Reform Club,S.W.
1875		Hankey, Ernest Alers,
		Hinxton Hall, Saffron Walden, Essex.

Year of Election.		
1876		Hansard, Luke,
		68, *Lombard-street, E.C.*
1871		*Harcourt, Right Hon. Sir William Vernon, Q.C., M.P., F.R.S.,*
		Reform Club, S.W.
1886		*Hardcastle, Basil William,
		12, *Gainsborough-gardens, Hampstead, N.W.*
1883		Harding, G. P.,
		Golfers' Club, Whitehall-court, S.W.
1884		Hardy, George Francis, F.I.A.,
		Universal Life Ass. Soc., 1, King William-st., E.C.
1893		Harrap, Thomas,
		143, *Stamford-street, Ashton-under-Lyne, Lancs.*
1868		Harris, David,
		Caroline-park, Granton, Edinburgh.
1899		Harris, Frank Drew, M.B. (Lond.), D.P.H.,
		Cowley-hill, St. Helens, Lancashire.
1897		Harris, Walter Fred., F.I.C.A.,
		16, *Parliament-street, Hull.*
1887		Harris, William A., F.R.S.S.A.,
		Phœnix Chambers, Exchange, Liverpool.
1882	*p*	Harris, William James,
		Halwill Manor, Beaworthy, N. Devon.
1881	*c*	Harvey, Alfred Spalding, B.A.,
		67, *Lombard-street, E.C.*
1899		Harvey, Baldwin S.,
		67, *Lombard-street, E.C.*
1896		Hawkins, Willoughby R.,
		Bute Docks, Cardiff.
1897		Hayakawa, S.,
		The Treasury, Tokio, Japan.
1895	*d*	Haynes, Thomas Henry,
		Rough Down, Boxmoor, Herts.
1898	*p*	Hayward, Thomas Ernest, M.B. (Lond.), F.R.C.S.,
		Clipsley Lodge, Haydock, near St. Helens.
1896		Heap, George,
		The Charter House, Charterhouse-square, E C.
1887		*Heap, Ralph, junr.,
		1, *Brick-court, Temple, E.C.*
1896		*Heaton-Armstrong, William Charles, J.P.,
		30, *Portland-place, W.*
1884		Hedley, Robert Wilkin,
		41, *Parliament-street, Westminster S.W.*
1889		*Hemming, Arthur George, F.I.A.,
		12, *King William-street, E.C.*
1865		Hendriks, Augustus, F.I.A.,
		7, *Cornhill, E.C.*
1855	*c d p*	*HENDRIKS, FREDERICK, F.I.A.,
		7, *Vicarage-gate, Kensington, W.*

Year of Election.		
1897		Hepburn, Arnold,
		21, *Lingfield-road, Wimbledon.*
1888		Heriot, George,
		c/o *J. Pirie & Co.*, 5, *Whittington-av., Leadenhall-st., E.C.*
1898		Herring, George,
		1, *Hamilton-place, Piccadilly, W.*
1898		Hewart, Miss Beatrice, B.Sc., Lond.,
		20, *Croxted-road, West Dulwich, S.W.*
1881	*d*	Hewat, Archibald, F.I.A., F.F.A.,
		22, *George-street, Edinburgh.*
1890	*d*	Hewins, Professor W. A. S., M.A.,
		10, *Adelphi-terrace, W.C.; and The Rowans, Putney Lower Common, S.W.*
1895		Hewitt-Fletcher, Stanley, A.C.A.,
		Administration House, Zomba, B.C.A.
1886		Hibbert, H. F.,
		8, *Park-road, Chorley, Lancashire.*
1892	*c d p*	*Higgs, Henry, LL.B.,
		12, *Lyndhurst-road, Hampstead, N.W*
1878		*Hill, Frederick Morley,
		22, *Richmond-road, Barnsbury, N.*
1879		Hoare, H. N. Hamilton,
		121, *Sloane-street, S.W.*
1897	*d*	Hodgson, William Gill, A.S.A.A.,
		Municipal Buildings, West Hartlepool.
1895	*d*	Hoffman, Frederick L.,
		Prudential Ins. Co. of America, Newark, N.J., U.S.A.
1889		Hogg, Quintin (Alderman),
		2, *Cavendish-place, W.*
1888		Hollams, John,
		52, *Eaton-square, S.W.*
1895		Holland, Hon. Lionel Raleigh, M.P.,
		15, *Savile-row, W.*
1898		Holland, Robert Martin,
		68, *Lombard-street, E.C.*
1894	*d p*	Hollerith, Herman, Ph.D., &c.,
		1054, 31*st-street, Washington, D.C., U.S.A.*
1888		Hollington, Alfred J.,
		Aldgate, E.
1891	*d*	Hooker, Sir Joseph Dalton, G.C.S.I., F.R.S., &c.,
		The Camp, Sunningdale.
1895	*d p*	*Hooker, Reginald Hawthorn, M.A.,
		3, *Gray's Inn-place, W.C.*
1896		Hooper, Angus,
		Montreal, Canada.
1879		Hooper, George Norgate,
		Elmleigh, Hayne-road, Beckenham, Kent.

Year of Election.			
1878	*c*	*p*	Hooper, Wynnard,
			13, *Sumner-place, Onslow-square, S. W.*
1887			Hopkins, John,
			Little Boundes, Southborough, Kent.
1899			Hopkins, John Castell,
			51, *Richmond-street West, Toronto.*
1896			*Hopkinson, Samuel Day,
			75, *Old Broad-street, E.C.*
1894			Houldsworth, Sir William H., Bart., M.P.,
			35, *Grosvenor-place, S. W.*
1883			Howell, Francis Buller,
			2, *Middle Temple-lane, E.C.*
1883	*d*		Howell, George,
			Hampden House, Ellingham-road, Shepherd's Bush, W.
1897		*p*	Howell, Price,
			Lindfield, near Sydney, N.S.W.
1864	*d*		Hudson, Thomas,
			8, *Helix-gardens, Brixton, S.W.*
1895			Huelin, James Wilson (*Australian Financial Agency*).
			Central-bldgs., William-st., Perth, W. Australia.
1894			Hughes, Arthur John, C.I.E., M.I.C.E.,
			14, *Jairington-gardens, Eastbourne.*
1874	*c d p*		HUMPHREYS, NOEL ALGERNON (*Hon. Secretary*),
			General Register Office, Somerset House, Strand.
1893			Humphreys-Owen, Arthur Charles, M.P..
			Glansevern, Garthmyl, Montgomeryshire.
1883			Hunt, Richard Aldington, A.I.A.,
			County-buildings, Corporation-street, Birmingham.
1888			Hunter, George Burton,
			Wallsend-on-Tyne.
1890			Huth, Ferdinand M.,
			12, *Tokenhouse-yard, E.C.*
1888			Hyde, Clarendon G.,
			75, *Gloucester-terrace, Hyde-park, W.*
1887			Hyde, Henry Barry,
			5, *Eaton-rise, Ealing, W.*
1893	*d*		Hyde, John,
			1458, *Euclid-place, Washington, D.C., U.S.A*

Year of Election.			

1897 — Ingall, Godefroi Drew, F.I.S.,
  Auckland, New Zealand.

1874 — *d p* — *Ingall, William Thomas Fitzherbert Mackenzie,
  13, *Pinfold-road, Streatham, S.W.*

1869 — *Inglis, Cornelius, M.D.,
  Athenæum Club, S.W.

1899 — Ingram, Eustace,
  24, *Princess-road, Brownswood-park, N.*

1887 — Irvine, Somerset William D'Arcy, J.P.,
  Equitable Life Office of United States, Brisbane.

1864 — *Ivey, George Pearse,
  39, *Denmark-villas, West Brighton.*

1880 — *Jackson, The Right Hon. William Lawies, M.P.,
  Chapelallerton, Leeds.

1894 — Jamieson, George, C.M.G.,
  The Thatched House Club, St. James's-st., S.W.

1879 — Jamieson, George Auldjo,
  37, *Drumsheugh-gardens, Edinburgh.*

1872 — *c p* — JANSON, FREDERICK HALSEY, F.L.S.,
  41, *Finsbury-circus, E.C.*

1897 — Jay, E. Aubrey Hastings,
  Tower House, Woolwich.

1896 — *d* — Jenney, Charles Albert,
  58, *William-street, New York City, U.S.A.*

1898 — Jennings, Arthur Seymour,
  62, *Barry-road, East Dulwich, S.E.*

1881 — *Jersey, The Right Hon. the Earl of, P.C.,
  Osterley-park, Isleworth.

1881 — Johnson, Edwin Eltham,
  110, *Cannon-street, E.C.*

1891 — *d* — Johnson, George,
  Broadland, Harcourt-street, Heworth-road, York.

1888 — Johnson, John Grove,
  23, *Cross-street, Finsbury, E.C.*

1880 — Johnson, Walter,
  Rounton Grange, Northallerton.

1897 — Johnston, James,
  National Liberal Club, S.W.

1878 — *d* — Johnstone, Edward,
  Queensbury, South-road, Clapham-park, S.W.

1884 — *Jones, Edwin, J.P.,
  141, *Cannon-street, E.C.*

Year of Election.		
1878	d	Jones, Henry R. Bence, B.A.,
		Board of Trade, Whitehall-gardens, S.W.
1894	d p	Jones, Hugh Richard, M.A., M.D.,
		58a, Grove-street, Liverpool.
1888		Jones, J. Mortimer,
		12, Nicholas-lane, E.C.
1877		Jones, Theodore Brooke,
		70, Gracechurch-street, E.C.
1888	d	*Jordan, William Leighton,
		25, Jermyn-street, S.W.
1858	c d p	Jourdan, Francis,
		Normount, Torquay, Devon.
1889		Justican, Edwin, F.I.A.,
		St. Mildred's House, Poultry, E.C.
1898		Karminski, Eugene,
		Credit Lyonnais, 40, Lombard-street, E.C.
1895		Karpeles, Benno, LL.D.,
		xix/2 Arm Crustergasse 6, Vienna.
1873		Kay, Duncan James,
		Drumpark, Dumfries, N.B.
1885		Keen, William Brock,
		3, Church-court, Old Jewry, E.C.
1884		Kelly, Edward Festus,
		182—184, High Holborn, W.C.
1883	c d	KELTIE, JOHN SCOTT, F.R.G.S., LL.D.,
		27, Compayne-gardens, West Hampstead.
1884	d	Kemp, John,
		46, Cannon-street, E.C.
1884	c d	*Kennedy, Sir Charles Malcolm, K.C.M.G., C.B.,
		4, Louisa-terrace, Exmouth, South Devon.
1886		Kennedy, John Gordon,
		Foreign Office, S.W.
1878		Kennedy, J. Murray,
		New University Club, St. James's-street, S.W.
1881	c	*Kennett-Barrington, Sir V. Huuter, M.A., LL.M.
		57, Albert Hall Mansions, S.W.
1898		Kent, Arthur C.,
		47, Buckingham Palace-road, S.W.
1895		*Kenyon, James, M.P.,
		Walshaw Hall, Bury, Lancashire.
1899		Kershaw, John Baker C., F.I.C.,
		Faraday House, Charing Cross-road, W.C.

Year of Election.		
1883		*Keynes, John Neville, M.A., D.Sc.,
		6, *Harvey-road, Cambridge.*
1884		Kimber, Henry, M.P.,
		79, *Lombard-street, E.C.*
1852		Kimberley, The Right Hon. the Earl of, M.A., P.C.,
		35, *Lowndes-square, S.W.*
1898	*d*	*King, Arthur William Waterlow,
		Orchard House, Gt. Smith-st., Westminster, S.W.
1883		*King, Bolton, B.A.,
		Gaydon, Warwick.
1884		Kirby, Horace Woodburn, F.C.A.,
		19, *Birchin-lane, E.C.*
1894		Kirkcaldy, William Melville,
		Eglinton, Dunedin, Otago, New Zealand.
1888		*Kitson, Sir James, Bart., M.P., J.P.,
		Gledhow Hall, Leeds.
1889		Kloetgen, W. J. H.,
		34, *Gutter-lane, Cheapside, E.C.*
1899	*d*	Knights, John Martin,
		39, *Tennyson-avenue, East Ham, Essex.*
1878		*Kusaka, Yoshio,
		First National Bank, Tokio, Japan.
1897		Lamperd, Frederick,
		Normanville, Constitution-hill, Ipswich.
1885		Latham, Baldwin, M.Inst. C.E.,
		Duppas House, Old Town, Croydon.
1892		Latham, Stanley A., A.C.A.,
		2, *Hare-court, Temple, E.C.*
1874	*c d p*	Lawes, Sir John Bennett, Bart., LL.D, F.R.S.,
		Rothamsted-park, St. Albans.
1897	*d*	*Lawrence, Frederick William, M.A.,
		79, *Lancaster-gate, W.*
1890		Lawson, William Ramage,
		Finchley Lodge, North Finchley.
1883	*d*	*Leadam, Isaac Saunders, M.A.,
		1, *The Cloisters, Temple, E.C.; and Reform Club, S.W.*
1886		Leathes, Stanley M.,
		Trinity College, Cambridge.
1899		Lee, Arthur,
		10, *Berkeley-square, Clifton, Bristol.*
1879		*Leete, Joseph,
		36, *St. Mary-at-hill, E.C.; and Eversden, S. Norwood-park.*

Year of Election.		
1899		L'Estrange, Charles James,
		6, *Blythswood-square, Glasgow.*
1877	c d p	LEFEVRE, THE RIGHT HON. GEORGE SHAW, M.A.,
		J.P. (*Honorary Vice-President*),
		18, *Bryanston-square, W.*
1887		Leitch, Alexander (*Scottish Provident Institution*),
		17, *King William-street, E.C.*
1892		Leon, Herbert Samuel,
		Bletchley-park, Bletchley, Bucks.
1888		*Le Poer-Trench, Col. The Hon. W., R.E., J.P.,
		3, *Hyde Park-gardens, W.*
1887		*Le-Roy-Lewis, Herman, B.A.,
		Westbury House, Petersfield, Hants.
1898		Leveaux, Arthur Michael, A.I.A.,
		28, *Abingdon-street, Westminster, S.W.*
1862		Lewis, Robert,
		1, *Bartholomew-lane, E.C.*
1888		*Liberty, A. Lasenby,
		The Manor House, The Lee, near Gt. Missenden,
		Bucks.
1884		*Lines, William Edward,
		2, *Essex-court, Temple, E.C.*
1898		Litkie, Valerian A.,
		39, *South-street, W.*
1892		Llewelyn, Sir John T. D., Bart., M.P.,
		Penllergare, Swansea.
1879		Lloyd, Wilson, J.P., F.R.G.S.,
		Park Lane House, Wood-green, Wednesbury.
1888	c d p	LOCH, CHARLES S., B.A.,
		Drylaw Hatch, Esher.
1882	c d p	*Longstaff, George Blundell, M.A., M.D., F.R.C.P.,
		Highlands, Putney Heath, S.W.
1876		*Lornie, John Guthrie, J.P. (*of Birnam & Pitcastle*),
		Rosemount, Kirkcaldy, N.B.
1892	d	Lough, Thomas, M.P.,
		49, *Ashley-gardens, Westminster, S.W.*
1886		*Low, Malcolm,
		22, *Roland-gardens, S.W.*
1895		Lowe, Thomas Enoch, F.S.A.A.,
		89, *Darlington-street, Wolverhampton.*
1889		Lowles, John, M.P.,
		Hill Crest, Darenth-road, Stamford-hill, N.
1865	c p	LUBBOCK, THE RIGHT HON. SIR JOHN, BART., M.P.,
		F.R.S. (*Trustee*),
		High Elms, Farnborough, Kent.
1878		Lucas, Sir Thomas, Bart., J.P.,
		Broad Sanctuary-chambers, Westminster, S.W.

Year of Election.		
1875		*Mabson, Richard Rous,
		" *The Statist*," 51, *Cannon-street, E.C.*
1873		*Macandrew, William, J.P.,
		Westwood House, near Colchester.
1894		Macaulay, Thomas Bassett,
		Sun Life Assurance Co., Montreal, Canada.
1884		McCabe, William LL.B., F.I.A.,
		Drawer 2591, Toronto, Canada.
1888		McCankie, James,
		63, *George-street, Edinburgh.*
1867		M'Clean, Frank,
		Rusthall House, Tunbridge Wells.
1892		McCleery, James C.,
		Old Bank Chambers, 8, Park-row, Leeds.
1897		MacDonald, Mrs. Margaret Ethel,
		3, *Lincoln's Inn Fields, W.C.*
1898		*Macdonald, Robert Alexander,
		Royal Bank of Scotland, Edinburgh.
1872	c d p	MACDONELL, JOHN, C.B., LL.D.,
		Room 183, The Royal Courts of Justice, W.C.
1873		*McEwen, Laurence T.,
		c/o. *R. A. McLean*, 1, *Queen Victoria-st., E.C.*
1899	d	McHardy, Coghlan McLean, J.P.,
		1, *Grenville-place, Cromwell-road, S.W*
1886		*Mackenzie, Colin, F.R.G.S.,
1878		McKewan, William,
		Elmfield, Bickley, Kent.
1876		*McLean, Robert Allan, F.R.G.S.,
		1, *Queen Victoria-street, E.C.*
1863		*Maclure, Sir John William, Bart., M.P., J.P., D.L.,
		Carlton Club; and The Home, Whalley Range, Manchester.
1888	d	McNiel, Henry,
		4, *Great George-street, S.W.*
1875		Macpherson, Hugh Martin, F.R.C.S (*Inspector General*),
		6, *Arlington-street, S.W.*
1882		MacRosty, Alexander,
		West Bank, Esher.
1899		*MacWharrie, Niel Matheson,
		Toftcombs, Biggar.

Year of Election.		
1891		Maidment, Thomas,
		Insurance Chambers, Southsea.
1887		Malleson, Frank R.,
		Dixton Manor House, Winchcombe, Cheltenham.
1884		*Manson, Frederick William,
		Ringmer, near Lewes, Sussex.
1888		Manuel, James,
		c/o The London and Provincial Bank, Cardiff.
1877		*Maple, Sir John Blundell, Bart., M.P.,
		8, *Clarence-terrace, Regent's-park, N.W.*
1880	*c d p*	*Marshall, Professor Alfred, M.A.,
		Balliol Croft, Madingley-road, Cambridge.
1894		Marshall, David,
		P.O Box 327, 4, *Equitable-bldgs., Durban, Natal.*
1887		Marshall, W. Bayley, M.Inst.C.E., M.Inst.M.E.,
		Struan, Richmond Hill, Edgbaston, Birmingham.
1887		Martin, James,
		4, *King-street, Cheapside, E.C.*
1899		Martin, John Roxburgh,
		Asst. Government Statist, Sydney, N.S.W.
1872	*c d p*	*MARTIN, RICHARD BIDDULPH, M.A., M.P. (*Vice-President and Treasurer*)
		10, *Hill-street, Berkeley-square, W.*
1898	*p*	Martineau, George, F.C.S.,
		Gomshall Lodge, Gomshall, Guildford.
1884		Mason, William Arthur,
		31*a, Colmore-row, Birmingham.*
1898		Massingberd, Stephen, B.A.,
		Gunby Hall, Burgh, Lincolnshire.
1875		*Mathers, John Shackleton,
		Hanover House, Leeds, Yorkshire.
1883	*d*	Mathieson, Frederic Coxhead,
		Beechworth, Hampstead, N.W.
1882		Medhurst, John Thomas, F.S.A.A.,
		City of London College, White-street, Moorfields, E.C.
1853		*Meikle, James, F.I.A.,
		6, *St. Andrew's-square, Edinburgh.*
1899		Mendl, Sigismund Ferdinand, M.P.,
		14, *Devonshire-street, Portland-place, W.*
1884		Merton, Zachary,
		c/o H. R. Merton & Co., Ltd., 2, *Metal Exchange-buildings, E.C.*
1899		Miller, James William,
		41, *Hopefield-avenue, Belfast.*
1889		Mills, Major Henry Farnsby,
1897		Milne, C. Williamson,
		51, *Linden-gardens, Notting-hill, W.*

Year of Election.		
1892	c d	Milner, His Excellency Sir Alfred, G.C.M.G., K.C.B., *Government House, Cape Town.*
1882	p	Milnes, Alfred, M.A., *44, Goldhurst-terrace, S. Hampstead, N.W.*
1899		Mistri, Nusserwanji Rustomji, *4, Bruce-lane, Fort-Bombay.*
1874		*Mocatta, Frederick D., F.R.G.S., *9, Connaught-place, W.*
1878		Moffat, Robert J., *Bank House, Cambridge.*
1888	d	*Molloy, William R. J., M.R.I.A. (*National Education Board*), *78, Kenilworth-square, Rathgar, Dublin.*
1899		*Moon, Edward Robert Pacy, M.P., *32, Egerton-gardens, W.*
1887		Moore, Arthur Chisholm, *23, Essex-street, Strand, W.C.*
1874		Moore, Charles Rendall, *137, Brockley-road, Lewisham High-road, S.E.*
1878		*Moore, John Byers Gunning, *Loymount, Cookstown, Ireland.*
1899		Morgan, Edward, *Prudential Ass. Co., Ltd., 5, Stepney-street, Llanelly, S. Wales.*
1893	d	Morgan, Percy Charlton, *5, Victoria-street, S.W.*
1874		*Morris, James, M.D., F.R.C.S., *13, Somers-place, Hyde Park-square, W.*
1888		Morris, John (17, *Throgmorton-avenue, E.C.*), *34, Hyde Park-square, W.*
1899		Morris, Thomas Morgan, F.R.C.I., *45, Queen-street, Neath, South Wales.*
1891	c d p	MORRISON, REV. WILLIAM DOUGLAS, LL.D., *2, Embankment-gardens, Chelsea, S.W.*
1885		*Mosley, Tonman, *Bangors, Iver, Uxbridge.*
1886	c	MOWBRAY, SIR ROBERT GRAY CORNISH, Bart., *10, Little Stanhope-street, S.W.*
1886	d	Moxon, Thomas B., *Lancs. and Yorks. Bank, King-st., Manchester.*
1889		Muir, Robert, junr., *Clydesdale, Wolseley-road, Crouch-end, N.*
1883		Muirhead, Henry James, *Fairfield, Hythe, Kent; and Reform Club, S.W.*
1899	d	Muirhead, James Muirhead Potter, *Grahamstown, South Africa.*
1899		Mukerji, Benoy Vehari, B.A., B.Litt., *42, Drummond-road, Agra, N.W.P., India.*
1880	d	Mulhall, Michael George, *255, Via Nazionale, Rome.*

Year of Election.		
1897	*d*	Mullins, George Lane, M.A., M.D., *Murong, Albion-street, Waverley, Sydney, N.S.W.*
1891	*d*	Murphy, Shirley Foster, M.R.C.S., *22, Endsleigh-street, Tavistock-square, W.C.*
1878	*d*	Murray, Adam, *Hazeldean, Kersal, Manchester.*
1892		Naoroji, Dadabhai, *Washington House, 72, Anerley-park, S.E.*
1878		*Nathan, Henry,
1869	*c d p*	NEISON, FRANCIS GUSTAVUS PAULUS, F.I.A., *93, Adelaide-road, South Hampstead.*
1898		Nelson, Charles Hewetson, A.S.A.A., *196, Liscard-road, Liscard, Liverpool.*
1895		Nesbitt, Thomas Huggins (*Vestry Clerk*), *Mount-street, Grosvenor-square, W.*
1897	*d*	Neumann, Joseph Oscar, *139, Salisbury-court, Fleet-street, E.C.*
1877		Nevill, Charles Henry, *11, Queen Victoria-street, E.C.*
1894		Newey, William Lewis, F.S.A.A., *39, Temple-row, Birmingham.*
1889	*d p*	Newsholme, Arthur, M.D., *11, Gloucester-place, Brighton.*
1895	*c*	*Nicholson, Charles Norris, *35, Harrington-gardens, South Kensington, S.W.*
1878	*d p*	Nicholson, Professor J. Shield, M.A., D.Sc., *University of Edinburgh.*
1858	*d*	Nightingale, Miss Florence, *10, South-street, Park-lane, W.*
1871		*Noble, Benjamin, F.R.A.S., *Westmorland House, Low Fell, Gateshead.*

1877	*d*	Norman, General Sir Henry Wylie, K.C.B.,
		    G.C.M.G. (*Agent-General for Queensland*),
		    85, Onslow-gardens, S.W.

1889		Northampton, The Most Hon. the Marquess of, *51, Lennox-gardens, S.W.*

1878		Northbrook, The Right Hon. the Earl of, G.C.S.I.,
		    D.C.L.,
		    4 Hamilton-place, Piccadilly, W.

Year of Election.		
1888		Oakley, Sir Henry,
		37, *Chester-terrace, Regent's-park, N.W.*
1899		O'Connor, John Edward, M.B., B.Ch.,
		1, *Surrey-street, Lowestoft.*
1898		O'Connor, Percival C. Scott,
		Chapra, Bengal, India.
1893		O'Connor, Vincent C. Scott,
		Authors' Club, 3, Whitehall-court; and c/o W.
		Watson & Co., 7, Waterloo-place, S.W.
1880		*Oelsner, Isidor,
1885	c d p	Ogle, William, M.A., M.D., F.R.C.P., &c.,
		10, *Gordon-street, Gordon-square, W.C.*
1885	d	*Oldham, John,
		River Plate Telegraph Company, Montevideo.
1884		Oldroyd, Mark, M.P.,
		Hyrstlands, Dewsbury, Yorkshire.
1896		Olney, George Washington, LL.B.,
		58, *William-street, New York City, U.S.A.*
1892	c	Onslow, The Right Hon. the Earl of, G.C.M.G.,
		Clandon-park, Guildford, Surrey.
1878		Oppenheim, Henry,
		16, *Bruton-street, Bond-street, W.*
1877		Ormond, Richard,
		24, *Grainger-street West, Newcastle-on-Tyne.*
1899		Ormsby, John Yeaden,
		Ontario Mutual Life Ass. Co., Woodstock,
		Ontario.
1894	d	Owen, Edgar Theodore,
		Registrar of Friendly Societies, Perth, W.A.
1887	d	Owen, Evan Frederick, A.I.A.,
		Actuary for Friendly Societies, Melbourne.
1887	d	*Page, Edward D. (*Box* 843),
		c/o Faulkner, Page, & Co., New York City.
1886		Pain, James,
		Lowlands, Wallington, Fareham.
1899		Paish, George,
		" *The Statist,*" 51, *Cannon-street, E.C.*

Year of Election.		
1866	c d p	*Palgrave, Robert Harry Inglis, F.R.S., *Belton, Great Yarmouth, Norfolk.*
1888		Pannell, William Henry, *Library Chambers, Basinghall-street, E.C.*
1878		Park, David Francis, C.A., F.F.A., A.I.A., *39, Lombard-street, E.C.*
1887		Parker, Archibald, *Camden Wood, Chislehurst, Kent*
1878		Parry, Thomas, *Grafton House, Ashton-under-Lyne.*
1883		Paterson, John, *1, Walbrook, E.C.*
1888		Pattullo, James Durie, *71, King William-street, E.C.*
1877		Paul, Henry Moncreiff, *12, Lansdowne-crescent, Notting-hill, W.*
1878		Paulin, David, *6, Forres-street, Edinburgh.*
1893	d	Payne, Alexander William, F.C.A., *70, Finsbury-pavement, E.C.*
1884		*Peace, Sir Walter, K.C.M.G., *26, Victoria-street, Westminster, S.W.*
1880		*Pease, Sir Joseph Whitwell, Bart., M.P., *Hutton Hall, Gisborough, Yorks.*
1895		Peixotto, M. Percy (*U.S. Equitable Life Office*), *36bis, Avenue de l' Opéra, Paris.*
1891	d	Penn-Lewis, William, *48, Springfield-road, Leicester.*
1894	d	Perris, George Herbert (Literary Agency of London), *5, Henrietta-street, W.C.*
1890		Peters, John Wyatt,
1883		Petheram, Frederick William, F.C.A., *Moorfield-chmbrs., 95, Fnisbury-pavement, E.C.*
1886		Peto, Sir Henry, Bart., M.A., *Chedington Court, Misterton, Crewkerne, Somer- setshire.*
1887		Phelps, Lieut.-General Arthur, *23, Augustus-road, Edgbaston, Birmingham*
1886	d	*Phelps, The Rev. Lancelot Ridley, M.A., *Oriel College, Oxford.*
1895		Phillips, Robert Edward (A.M.Inst.C.E.), *70, Chancery-lane, E.C.*
1871	d	*Pickering, John, F.R.G.S., F.S.A., *86, Thicket-road, Anerley, S.E.*
1898		Pietersen, James Frederick Gerhard, L.R.C.P., M.R.C.S., *Ashwood House, Kingswinford, Dudley.*
1878	d	*Pim, Joseph Todhunter, *Rinnamara, Monkstown, Co. Dublin.*

Year of Election.		
1886		Pink, J. Francis,
		62, *Chandos-street, Strand, W.C.*
1877		Pirbright, The Right Hon. Lord,
		Carlton Club, Pall Mall, S.W.
1890	*c d*	Pittar, Thomas J., C.B.,
		H.M. Custom House, E.C.
1881		Planck, Charles, M.R.C.S. (*Deputy Surgeon-General*),
1883	*d*	Platt, James,
		Rookwood, Hampstead, N.W.
1895		Platt-Higgins, Frederick, M.P.,
		Homeleigh, Bowdon, Cheshire.
1861	*c d*	Plowden, Sir Wm. Chicele, K.C.S.I.,
		5, *Park-crescent, Portland-place, W.; and*
		Aston Rowant House, Tetsworth, Oxon.
1888		Pollard, James, J.P.,
		Chamber of Commerce, Edinburgh.
1884		Polson, John,
		West Mount, Paisley, N.B.
1896		*Pontifex, Bryan, A.C.A.,
		East India Railway Co., Calcutta.
1891		Pope, Henry Richard,
		Iddesleigh Mansions, Westminster, S.W.
1891		Potter, Henry,
		222, *Queen's-road, New Cross Gate, S.E.*
1879	*c*	*POWELL, SIR FRANCIS SHARP, Bart., M.P. (*Vice-President*),
		Horton Old Hall, Bradford; and 1, Cambridge-square, Hyde-park, W.
1895		Powell, Thomas Edmund,
		Oakridge, Dorking.
1871		Power, Edward,
		16, *Southwell-gardens, South Kensington, S.W.*
1877		*Prance, Reginald Heber,
		Frognal, Hampstead, N.W.
1877	*d*	Praschkauer, Maximilian,
		109, *Fenchurch-street, E.C.*
1867		*Pratt, Robert Lindsay,
		80, *Bondgate, Darlington.*
1896		Pretyman, Captain Ernest George, M.P.,
		Orwell-park, Ipswich.
1887	*c d p*	*Price, L. L., M.A.,
		Oriel College, Oxford.
1877	*c d p*	PRICE-WILLIAMS, RICHARD, M.Inst.C.E.,
		15, *Victoria-street, S.W.*
1897		Primrose, Sir Henry William, K.C.B., C.S.I.,
		Inland Revenue Office, Somerset House, W.C.
1887	*c d p*	PROBYN, LESLEY CHARLES (*Vice-President*),
		79, *Onslow-square, S.W.*

Year of Election.		
1889		Probyn, Lieut.-Colonel Clifford,
		55, *Grosvenor-street, Grosvenor-square*, W.
1884		*Proctor, William,
		Bankfield, Upper Chorlton-road, Manchester
1886		Provand, Andrew Dryburgh, M.P.,
		2, *Whitehall-court, S. W.*
1896		Pryor, Edward Thomas,
		23, *Fore-street, E.C.*
1871	c	Puleston, Sir John Henry,
		2, *Bank-buildings, Princes-street, E.C.*
1886		Pulley, Sir Joseph, Bart.,
		Lower Eaton, Hereford.

1883		Rabbidge, Richard, F.C.A.,
		32, *Poultry, E.C.*
1872	d p	*Rabino, Joseph,
		Chief Manager, Imperial Bank of Persia, Teheran.
1888		*Radcliffe, Sir David, J.P.,
		Rosebank, Knowsley, Prescot.
1858		*Radstock, The Right Hon. Lord,
		Mayfield, Woolston, Southampton.
1888	d	Rae, George,
		Redcourt, Birkenhead.
1885	c d	Rae, John, M.A.,
		37, *Werter-road, Putney, S. W.*
1887	d p	Raffalovich, His Excellency Arthur,
		19, *Avenue Hoche, Paris.*
1897		Rai, Bihari Lal, F.R.S.L. (*Saugor, C.P., India*),
		c/o *W. Watson & Co., 7, Waterloo-place, S. W.*
1860		Ramsay, Alexander Gillespie, F.I.A.,
		Canada Life Ass. Co., Hamilton, Canada, West.
1885		Randell, James S.,
		19, *Alfred-street, Bath.*
1880	c	Rankin, Sir James, Bart., M.P.,
		35, *Ennismore-gardens, Prince's-gate, S. W.*
1897		Ranson, Albert,
		32, *Westgate-street, Ipswich.*
1884		Raphael, Alfred,
		34, *Warwick-road, Maida Vale, W.*
1878		Rathbone, William,
		Greenbank, Liverpool, E.
1884		*Ravenscroft, Francis,
		Birkbeck Bank, Chancery-lane, W.C.

Year of Election.		
1874	c d p	*Ravenstein, Ernest George, F.R.G.S.,
		2, *York-mansions, Battersea-park, S.W.*
1886		Rawlins, Frederick,
		Southport, Queensland.
1877		*Rawlins, Thomas,
		45, *King William-street, E.C.*
1895		Rawlinson, Albert,
		3/5, *Garstin's-place, Calcutta.*
1895		Rawson, Cecil Frank, B.A.,
		Iveden, Burghill-road, Sydenham, S.E.
1893		Rea, Charles Herbert Edmund,
		223, *Norwood-road, Herne-hill, S.E.*
1889		*Reed, Thomas, F.C.A.,
		63, *King-street, South Shields.*
1888	d	Reid, Herbert Lloyd,
		72, *Central-hill, Upper Norwood, S.E.*
1898		Renwick, William George,
		11, *Pembroke-terrace, Penge, S.E.*
1888	c d p	REW, ROBERT HENRY,
		14, *Castletown-road, West Kensington, W.*
1886		Rhens, Robert,
		102, *Greenwood-road, Hackney, N.E.*
1888		Rhodes, George Webber,
		131, *Wool Exchange, E.C.*
1899		Rhodes, Thomas,
		14, *St.Thomas's-mansions, WestminsterBdge.,S.E*
1895		Richards, Roger C. (*Inner Temple*),
		Crayford House, Honor Oak-road, S.E.
1896		Richards, Samuel Norman,
		583, *Seven Sisters-road, Tottenham.*
1899		Richardson, George Henry, F.I.S.,
		23, *Wood View, Manningham, Bradford.*
1895		Richardson, Thomas, M.P.,
		Kirklevington Grange, Yarm, Yorks.
1873		Ripon, The Most Hon. the Marquess of, K.G., F.R.S., &c.,
		9, *Chelsea Embankment, S.W.*
1898		Ritchie, Frank Baillie,
		Burglary Insurance Security Co.,63, St. James's-street, S.W.
1892		Rivington, Francis Hansard,
		44, *Connaught-square, W.*
1882		Roberts, Edward, F.R.A.S. (*Nautical Almanac Office*),
		3, *Verulam-buildings, Gray's Inn, W.C.*
1894	d p	Robertson, James Barr,
		National Liberal Club, S.W.
1886	d	Roechling, Herman Alfred, A.M. Inst. C.E.,
		14, *Market-street, Leicester.*

Year of Election.		
1880		*Ronald, Byron L.,
		14, *Upper Phillimore-gardens*, W.
1873	c	*Rosebery, The Right Hon. the Earl of, LL.D., F.R.S.,
		38, *Berkeley-square*, W.
1892		Ross, Charles Edmonstone, F.S.A.A.,
		Royal Societies' Club, St. James's-street, S.W.
1893	d	Rothwell, Richard Pennefather (*Editor, Engineering and Mining Journal*),
		253, *Broadway, Room* 817, *New York, U.S.A.*
1897		Rothwell, William Thomas, J.P.,
		Newton Heath, near Manchester.
1899		Rowntree, Benjamin Seebohm,
		32, *St. Mary's, York.*
1899		Rowthorn, Charles Frank, F.R.M.S., R.A.S.,
		The Vicarage, Oughtibridge, Sheffield.
1898	d	Rozenraad, Cornelius,
		4, *Moreton-gardens, Kensington*, W.
1890		Ruffer, Marc Armand, M.A., M.D., B.Sc.,
		Medical School, Cairo, Egypt.
1888		Rusher, Edward Arthur, F.I.A.,
		142, *Holborn Bars*, E.C.
1886		Russell, Arthur, B., A.C.A.,
		11, *Ludgate-hill*, E.C.; *and* 16, *Dartmouth Park-road*, N.W.
1878	d	Russell, Richard F.,
		8, *John-street, Adelphi*, W.C.
1873		Rutherford-Elliot, J. G.,
		Elphinstone, Tyndall's Park-road, Clifton, Bristol.
1894	d	Sachs, Edwin Otho,
		3, *Waterloo-place, Pall Mall*, S.W.
1873		*Salisbury, The Most Hon. the Marquess of, K.G., P.C., F.R.S.,
		20, *Arlington-street*, W.
1898		Salmon, Richard George, F.I.A.,
		Sun Life Assurance Society, Threadneedle-street, E.C.
1875	d	*Salomons, Sir David Lionel, Bart., J.P.,
		Broom-hill, Tunbridge Wells.
1876		Salt, Sir Thomas, Bart.,
		Weeping Cross, Stafford.
1892		Samuel, Charles,
		176, *Sutherland-avenue, Harrow-road*, W.

Year of Election.		
1868	*c*	Samuelson, Sir Bernhard, Bart., F.R.S., 56, *Prince's-gate, Hyde-park, S.W.*
1899	*d*	Sanderson, Frank, M.A., *Canada Life Ass. Co., Toronto, Canada.*
1895		Sanger, Charles Percy, B.A., 3, *Hare-court, Inner Temple, E.C.*
1891		*Sarda, Pandit Har Bilas, B.A., M.R.A.S., *Government College, Ajmere, India.*
1895		Satthianadhan, Professor S., M.A., *Presidency College, Madras, India.*
1886	*d p*	Sauerbeck, Augustus, c/o *Helmuth Schwartz & Co., 3 & 4, Moorgate-street-buildings, E.C.*
1893		Saunders, Cecil Roy, F.I. Inst., *Eling House, Eling, Hants.*
1877		Saunders, Charles Edward, M.D., *County Asylum, Hayward's Heath, Sussex.*
1852		Saunders, James Ebenezer, F.G.S., J.P., 4, *Coleman-street, E.C.*
1888		Sawyer, Lucian Willard, 96, *Palmerston-buildings, Bishopsgate-street, E.C.*
1887		*Scarth, Leveson, M.A., *Elms Lea, Cleveland-walk, Bath.*
1883		Schidrowitz, Samuel,
1877		Schiff, Charles, 22, *Lowndes-square, S.W.*
1891	*d p*	*Schloss, David F., M.A., *Hill House, Wimbledon.*
1895		Schmidt, Hermann, *Lombard House, George-yard, Lombard-st., E.C.*
1891		Schooling, John Holt, *Fotheringay House, Montpelier-row, Twickenham.*
1895		Schuurman, Willem H. A. Elink, *Oudegracht Tz. 146, Utrecht.*
1883		*Schwann, John Frederick, *Oakfield, Wimbledon; and 6, Moorgate-st., E.C.*
1888		Scotter, Sir Charles, *Surbiton.*
1887	*c d*	Seaton, Edward, M.D. (Lond.), F.R.C.P., *The Limes, Clapham-common, S.W.*
1880		*Seeley, Sir Charles, Bart., M.P., *Sherwood Lodge, Nottingham.*
1899		Setchfield, George Beeby, M.B.P.A., *Refuge Ass. Co., 245, Western Bank, Sheffield.*
1886	*d p*	Seyd, Ernest J. F., 38, *Lombard-street, E.C.*
1873	*d*	Seyd, Richard, 38, *Lombard-street, E.C.*

Year of Election.		
1894		Shaw, William Arthur, M.A.,
		3 and 4, *Lincoln's Inn-fields, W.C.*
1898		Shaw, William Napier, M.A., F.R.S.,
		Emmanuel House, Cambridge.
1896	*p*	Sheppard, William Fleetwood, M.A., LL.M.,
		2, *Temple-gardens, E.C.*
1898	*d*	Sherwell, Arthur,
		20, *Endsleigh-terrace, Duke's-road, W.C*
1885		Sherwin, Joseph Henry,
		7, *Whitehall-place, S.W.*
1888		Shillcock, Joshua, M.A.,
		Bank of England, West Branch, Burlington-gardens, W.
1871	*d*	Sidgwick, Professor Henry, M.A.,
		Trinity College, Cambridge.
1886		Silver, Stephen William,
		3, *York-gate, Regent's-park, N.W.*
1878	*d*	Simmonds, G. Harvey,
		1, *Whitehall, S.W.*
1892		*Sinclair, Captain John, M.P.,
		101, *Mount-street, Berkeley-square, W.*
1881	*d*	Skrine, Francis Henry B., J.P.,
		19, *The Grove, Boltons, S.W.*
1838		Slade, Alfred Thomas,
		Wardrobe Chambers, Queen Victoria-street, E.C.
1888		Slade, Francis William,
		17, *Victoria-street, Westminster, S.W.*
1883		Sly, Richard Stevens, J.P., F.R.G.S.,
		Fern Villa, Queen's-road, New Cross Gate, S.E.
1869	*d*	Smee, Alfred Hutcheson, M.R.C.S.,
		The Grange, Wallington, Surrey.
1878		*Smith, Charles, M.R.I.A., F.G.S., Assoc. Inst. C.E.,
		c/o Sir Henry Gilbert, Harpenden, St. Albans.
1896		Smith, Edward,
		75, *Gore-road, South Hackney, N.E.*
1871		Smith, E. Cozens,
		1, *Old Broad-street, E.C.*
1878	*d*	*Smith, George, LL.D., C.I.E.,
		Serampore House, Napier-road, Edinburgh.
1889	*d*	Smith, George Armitage, M.A.,
		3, *Albert-terrace, Regent's-park, N.W.*
1888	*c d*	SMITH, H. LLEWELLYN, M.A., B.Sc.,
		4, *Harcourt-buildings, Temple, E.C.*
1877		Smith, Howard S., A.I.A., F.F.A.,
		Bank Chambers, 14, Waterloo-street, Birmingham.
1891		Smith, James Parker, M.P.,
		Jordanhill, Partick, N.B.
1877		Smith, John,
		8, *Old Jewry, E.C.*

Year of Election.		
1883	*c*	Smith, Samuel, M.P., 11, *Delahay-street, Westminster; and Reform Club, S.W.*
1888		Smith, Walter J., *St. Bartholomew's Chmbs.*, 61, *W. Smithfield, E.C.*
1890		Smith, William Alexander, J.P., *Arpafeelie, Moorebank, N.S.W.*
1894		*Smith, The Hon. William Frederick Danvers, M.P., 3, *Grosvenor-place, S.W.*
1894		Smithers, Frederick Oldershaw, 171, *Adelaide-road, Hampstead, N.W.*
1887		Snell, Arthur Henry, 6, *Rood-lane, E.C.*
1899		Sorley, James, F.I.A., F.F.A., F.R.S.E., 32, *Onslow-square, S.W.*
1897		Southgate, Henry William, 33, *Springfield-place, Leeds.*
1895		Soward, Alfred Walter, 28, *Therapia-road, Honor Oak, S.E.*
1855	*d*	Sowray, John Russell, 2, *Prince's Mansions, Victoria-street, S.W.*
1896		Sparrow, Frederick Syer, c/o *J. Wonfor*, 24, *Yonge-park, Seven Sisters-road, N.*
1889		Speirs, Edwin Robert, 65–67, *Gracechurch-street, E.C.*
1867		*Spencer, Robert James,
1892		Spender, John Alfred, M.A., 29, *Cheyne-walk, S.W.*
1897		Spensley, J. Calvert (*Stat. Dept., L.C.C.*), *Leighton Hall, Leighton-crescent, N.W.*
1883		Spicer, Albert, 50, *Upper Thames-street, E.C.*
1898		Spicer, Edward Samuel, 73, *Philbeach-gardens, S.W.; and Reform Club.*
1856	*d*	*Sprague, Thomas Bond, M.A., LL.D., F.I.A., 26, *St. Andrew-square, Edinburgh.*
1882		Stack, Thomas Neville (9, *Crosby-square, E.C.*), 70, *Gloucester-crescent, Regent's-park, N.W.*
1889	*d*	Stanton, Arthur G. (13, *Rood-lane, E.C.*), *Oakfield, Eliot-park, Blackheath, S.E.*
1880		Stark, James, *Reversionary Interest Soc.*, 30, *Coleman-st E.C.*
1899		Stenberg, Ernst Gottfried, *Registrar-General's Office, Perth, W.A.*
1880		Stephens, William Davies, J.P. (Alderman), 2, *St. Thomas's-place, Newcastle-on-Tyne.*
1882		*Stern, Edward D., 4, *Carlton House-terrace, S.W.*

Year of Election.		
1885	*d*	Stevens, Marshall, *Bolton Lodge, near Eccles.*
1877		Stone, William Alfred. 90, *Cannon-street, E.C.; and Hayton, Bramley Hill, Croydon.*
1889		Stow, Harry Vane, *National Liberal Club, Whitehall-place, S.W.*
1872	*d*	Strachey, General Sir Richard, R.E., G.C.S.I., F.R.S., 69, *Lancaster-gate, W.*
1893		Strahan, Samuel Alexander Kenny, M.D.,
1883	*d*	*Strathcona and Mount Royal, The Right Hon. Lord, G.C.M.G. (*High Commissioner for Canada*), 17, *Victoria-street, S.W.*
1880		Strutt, Hon. Frederick, *Milford House, near Derby.*
1891		Stuart, Harold A., *c/o Arbuthnot and Co., Madras, India.*
1884		*Sugden, Richard, *The Farre Close, Brighouse, Yorkshire.*
1895		Sutherland, J. Francis, M.D., 4, *Murchiston-bank-avenue, Edinburgh.*
1899		Suzuki, Junichiro, *Japanese Consulate, 84, Bishopsgate-street Within, E.C.*
1881		Sykes, George Samuel, 1, *Grant's-lane, Calcutta, India.*
1894	*d*	Tagliaferro, Napoleone, F.R.H.S., *Education Office, Malta.*
1889	*d*	Tattersall, William, *Melbrook, Bowdon, Cheshire.*
1889		Tayler, Stephen Seaward (Alderman), 151, *Brixton-road, S.W.*
1887	*d*	Taylor, R. Whately Cooke, *Regent Chmbrs., 121, W. Regent-st., Glasgow.*
1888		*Taylor, Theodore Cooke, J.P., *Sunny Bank, Batley, Yorkshire.*
1898		Teasdale, William Alfred, 65, *Newsome-road, Huddersfield.*
1893		Teece, Richard, F.I.A., F.F.A., 87, *Pitt-street, Sydney, N.S.W.*

Year of Election.		
1884		Tempany, Thomas William, F.R.H.S., 25, *Bedford-row, W.C.*
1888	*d*	Temperley, William Angus, junr., 2, *St. Nicholas-buildings, Newcastle-on-Tyne.*
1888		Theobald, John Wilson, 85, *Palmerston-buildings, E.C.*
1889		Thodey, William Henry, 479, *Collins-street, Melbourne, Victoria.*
1888	*d*	Thomas, David Alfred, M.P., *Llanwern, near Newport, Mon.*
1899		Thomas, Henry, *Queen's-chambers, Neath, South Wales.*
1887		Thomas, John, 18, *Wood-street, E.C.*
1896	*d*	Thomas, John Tubb. L.R.C.P. & S. (Edin.), D.P.H., *Pevensey House, Trowbridge, Wilts.*
1879	*d*	Thomas, W. Cave, 47, *Russell-road, W.*
1864		*Thompson, Henry Yates, 19, *Portman-square, W.*
1895		Thomson, David Couper, J.P., *Dundee Courier Office, Dundee.*
1882		Tinker, James, *Hordlecliff, Lymington, Hants.*
1889		Touch, George Alexander, *Eaton Tower, Caterham Valley, Surrey.*
1899		Tozer, William Henry, 28, *Abingdon-street, Westminster, S.W.*
1868		*Treatt, Frank Burford, J.P., *Fernmount, Bellenger River, New South Wales.*
1868		Tritton, Joseph Herbert, 54, *Lombard-street, E.C.*
1892		Trobridge, Arthur, 13, *Fairlawn-park, Chiswick, W.*
1899		Turnbull, Robert Edward, 2, *Prince of Wales-terrace, Scarborough.*
1890		*Turner, Rev. Harward, M.D. (Paris), B.Sc., F.R.M.S.,
1885		Turner, William, c/o *The Librarian, Free Public Library, Trinity-street, Cardiff.*
1892		Tyler, Edgar Alfred, 1, *Queen Victoria-street, E.C.*
1841		Tyndall, William Henry, F.I.A., *Morlands, Oxford-road, Redhill.*
1893		Tyrer, Thomas, F.I.C., F.C.S., *Stirling Chemical Works, Stratford, E.*

Year of Election.		
1877	c d p	*Urlin, Richard Denny, 22, *Stafford-terrace, Phillimore-gardens, W.*
1888		Van Raalte, Marcus, 22, *Austin Friars, E.C.*
1890	d p	Venn, John, D.Sc., F.R.S., *Caius College, Cambridge.*
1889		*Venning, Charles Harrison, 33, *Old Broad-street, E.C.*
1888		Verdin, William Henry, J.P., *Winsford, Cheshire.*
1897	d	Verney, Sir Edmund, Bart., F.R.G.S., F.R.M.S., *Claydon House, Winslow, Bucks.*
1894		Verney, Frederick William, 6, *Onslow-gardens, S.W.*
1897		Vernon, Henry H., M.D., F.R.S. (Edin.), M.O.H., *Shipbrook, Cambridge-road, Southport, Lancs.*
1886	c	Verulam, The Right Hon. the Earl of, *Sopwell, St. Albans.*
1876		Vigers, Robert, 4, *Frederick's-place, Old Jewry, E.C.*
1885		Vincent, Frederick James, A.I.A. (*London, Glasgow, and Edinburgh Assurance Co.*), 26 & 27, *Farringdon-street, E.C.*
1877	d	Vine, Sir John Richard Somers, C.M.G., *Imperial Institute, S.W.*
1890	d	Walford, Ernest L., 2, *Shorter's-court, E.C.*
1868		Wallis, Charles James, 14, *Russell-square, W.C.*
1880	d	Wallis, E. White, 76, *Carlton-hill, N.W.*
1897		Walton, J. Herbert, *St. Ronan's, Teddington.*
1899		Ward, Joseph Frederick, 41, *Main-street, Port Elizabeth.*
1893		Ward, William Cullen, F.S.I.A., 17, *O'Connell-street, Sydney, N.S.W.*

Year of Election.		
1888		Warren, Reginald Augustus, J.P., *Preston-place, near Worthing.*
1888		Wartnaby, William Wade, *Market Harborough, Leicestershire.*
1865		Waterhouse, Edwin, B.A., A.I.A., F.C.A., *3, Frederick-place, Old Jewry.*
1886		Waters, Alfred Charles, *General Register Office, Somerset House, W.C.*
1892		Wates, Charles Marshall, *9, Dennington Pk.-mansions, West-end-lane, N.W.*
1894		Watson, Thomas Roberts, *14, Station-road, Prescot.*
1883		Watson, William Livingstone, *Reform Club Chambers, 105, Pall Mall, S.W.*
1885	*d*	*Watt, William, *17, Queen's-road, Aberdeen.*
1888		Webb, Henry Barlow, *Holmdale, Dorking.*
1893	*d*	Weedon, Thornhill, *Bryn-Mawr, Woolloongabba, Brisbane.*
1873	*c*	*Welby, The Right Hon. Lord, G.C.B., *11, Stratton-street, Piccadilly, W.*
1874		Welch, Charles, F.S.A., *Guildhall, E.C. (Representing the Library Committee of the Corporation of the City of London.)*
1889		Wells-Smith, Henry, A.C.A., *Kingsley House, Worksop, Notts.*
1855	*c d p*	Welton, Thomas Abercrombie, *22, Palace-road, Streatham-hill, S.W.*
1879		Wenley, James Adams, *Bank of Scotland, Bank-street, Edinburgh.*
1879		*Westlake, John, Q.C., LL.D., *The River House, 3, Chelsea Embankment.*
1882		*Whadcoat, John Henry, F.C.A., *Poole, Dorset.*
1883		*Whadcoat, William Edward, *54, Carleton-road, Tufnell-park, N.*
1878		Wharton, James, *Edgehill, Netherhall-gds., FitzJohn's-av., N.W.*
1887		Whinney, Frederick, *8, Old Jewry, E.C.*
1859		Whitbread, Samuel, *Southill-park, Biggleswade, Beds.*
1887		*White, The Rev. George Cecil, M.A., *Nursling Rectory, Southampton.*
1863		White, Leedham, *16, Wetherby-gardens, South Kensington, S.W.*
1888	*d*	Whitehead, Sir James, Bart., J.P., D.L. (Alderman), *Wilmington Manor, near Dartford.*

Year of Election.		
1895	*d*	Whitehead, The Hon. Thomas Henderson, M.L.C., *Chartered Bank of India, &c., Hong Kong.*
1892	*d*	Whitelegge, B. Arthur, M.D., 3, *Edwardes-place, Kensington, W.*
1884	*d*	Whiteley, William, *Westbourne-grove, Bayswater, W.*
1895		Whittuck, Edward Arthur, M.A., B.C.L., 77, *South Audley-street, W.*
1879		*Whitwill, Mark, J.P., *Bristol.*
1899		Wiener, Isidore, 3, *Harcourt-buildings, Temple, E.C.*
1891		Wigham, Matthew Thomas, A.S.A.A., 34 *and* 36, *Gresham-street, E.C.*
1884		Wightman, Charles, 1, *Fenchurch-avenue, E.C.*
1895		Wilenkin, Gregory, 7, *Wetherby-gardens, South Kensington, S.W.*
1893	*p*	Wilkinson, Rev. John Frome, M.A., *Barley Rectory, Royston, Herts.*
1875		Wilkinson, Thomas Read, *Vale Bank, Knutsford, Cheshire.*
1860		Willans, John Wrigley, *Mercury Office, Leeds.*
1896		*Williams, Major Charles Woolmer, *City Carlton Club, E.C.*
1897		Williams, Daniel Thomas, *P.O., Blaenclydach, Llynypia, R.S.O., Glam.*
1894		Williams, Edward Frederick, *Joint Stock Bank, Halifax.*
1897		*Williams, Ernest E., *Egmont Lodge, Church-row, Old Fulham, S.W.*
1864		Williams, Frederick Bessant, F.S.A. (Scot), 19, *Haymarket, S.W.*
1895		Williams, Harry Mallam, F.S.A. (Scot.), *Tilehurst, Priory-park, Kew.*
1888		*Williams, Robert, M.P., 20, *Birchin-lane, E.C.*
1895		*Willis, J. G., B.A., *Board of Trade, Whitehall-gardens, S.W.*
1898		Wilson, Alexander Johnstone, *Annandale, Atkin's-road, Clapham-park, S.W.*
1891		Wilson, Henry Joseph, M.P., *Osgathorpe Hills, Sheffield.*
1898		Wilson, Henry Wrigley, 144, *Elgin-avenue, W.*
1884		Wilson, James (*Deputy Commissioner*), *Rawalpindi, Punjab, India.*
1874	*d*	*Wilson, Robert Porter, 5, *Cumberland-terrace, Regent's-park, N.W.*

Year of Election.			
1897	d p		Wood, George Henry, 31, *Queen-street, Eastville, Bristol.*
1897			Woodd, Basil Aubrey Hollond, 35, *Tite-street, Chelsea, S.W.*
1887			Woodhouse, Coventry Archer, 30, *Mincing-lane, E.C.*
1890			Woollcombe, Robert Lloyd, LL.D., F.I. Inst., &c., 14, *Waterloo-road, Dublin.*
1890			Worroll, Charles, *Colonial Mutual Life Office, Adderley-street, Cape Town.*
1895			Worsfold, Edward Mowll, *Market Square, Dover.*
1878			Worsfold, Rev. John Napper, M.A., *Haddlesey Rectory, near Selby, Yorkshire.*
1887			Worthington, A. W., B.A., *Old Swinford, Stourbridge*
1895			Yanagisawa, Count Yasutoshi, 160, *Rue de la loi, Brussels.*
1886	c	p	Yerburgh, Robert Armstrong, M.P., 25, *Kensington Gore, S.W.*
1888			*Yglesias, Miguel, 2, *Tokenhouse-buildings, E.C.*
1877			*Youll, John Gibson, *Jesmond-road, Newcastle-on-Tyne.*
1897			Young, Norwood Crichton, 17, *Avenue-road, Regent's-park, N.W.*
1898			Young, Sydney, *The Corn Exchange, Mark-lane, E.C.*
1895	c	p	YULE, GEORGE UDNY, *City & Guilds Institute, Exhibition-road, S.W.; and 43, Heathhurst-rd., Hampstead, N.W.*

** *The Executive Committee request that any inaccuracy in the foregoing list may be pointed out to the ASSISTANT SECRETARY, and that all changes of address may be notified to him, so that delay in forwarding communications and the publications of the Society may be avoided.*

HONORARY FELLOWS.

IIIS ROYAL HIGHNESS THE PRINCE OF WALES, K.G.,

Honorary President.

<table>
<tr><td>Year of Election.</td><td></td><td></td></tr>
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Argentine Republic.

1890   *d*   DR. FRANCISCO LATZINA, **Calle Maipu, 982, Buenos Ayres.**

Director General of Statistics; Doctor *honoris causa* of the Faculty of Physical and Mathematical Sciences of the University of Cordoba; Knight of the Italian Order of S.S. Maurice and Lazare; Officer of the Academy of France; Member of the National Academy of Sciences, of the International Statistical Institute, of the Geographical and Statistical Societies of Paris, of the Society of Commercial Geography of Paris, and Corresponding Member of the National Historical Academy of Venezuela.

Austria-Hungary.

1890   *d*   DR. KARL THEODOR VON INAMA-STERNEGG, **Vienna.**

Doctor of Political Economy; Member of the Austrian House of Lords; President of the Imperial and Royal Central Statistical Commission; Professor at the University of Vienna; Member of the International Statistical Institute.

1893   *d*   DR. JOSEPH DE JEKELFALUSSY, **Budapest.**

Doctor *Juris;* Advocate; Chief of the Royal Hungarian Statistical Bureau; Ministerial Councillor; Knight of the Order of Francis Joseph; Second Vice-President of the Royal Hungarian Statistical Council; External Member of the Committee of Examiners for Political Sciences; Corresponding Member of the Hungarian Academy of Sciences; Member of the International Statistical Institute.

1893   *d*   DR. FRANZ RITTER VON JURASCHEK, **Kärnthner-strasse, 55, Vienna.**

Doctor *Juris et Philosophiæ;* "K.K. Regierungsrath;" Member and Secretary of the Imperial and Royal Central Statistical Commission; Professor at the University of Vienna; Professor of Public Law and of Statistics at the Military Academies, Vienna; Knight of the Austrian Order of the Iron Crown (3rd Class); Officer of the Order of the Crown of Italy; Member of the Permanent Commission for Commercial Values; of the International Statistical Institute; and of the British Economic Association.

Year of Election		
		Austria-Hungary—*Contd.*
1893	*d p*	JOSEPH KÖRÖSI, **Budapest.**

Director of the Municipal Statistical Bureau of Budapest; *Docent* at the University of Budapest; President of the Municipal Statistical Committee; Knight of Several Orders; Member of the Statistical Commissions of Hungary, Belgium, and Nijni - Novgorod; Honorary Member of the American Statistical Associations; Member of the Hungarian Academy of Science, of the International Statistical Institute, of the Statistical Societies of Manchester and Paris, of the British Economic Association, and of several other learned Societies.

1877	*d*	MAX WIRTH, **VI Dreihufeisengasse, Vienna.**

Economist; formerly Director of the Federal Statistical Bureau of Switzerland; Co-Editor of the "Neue Freie Presse."

Belgium.

1879	*d*	DR. EUGÈNE JANSSENS, **Rue du Lombard, 21, Brussels.**

Doctor of Medicine; Chief Inspector of the Board of Health of the City of Brussels; President of the Federal Committee of Health of the Brussels District; Member of the Central Statistical Commission, of the Superior Council of Health, of the Royal Academy of Medicine, and of the Local Medical Commission; Officer of the Belgian Order of Leopold and of the Italian Order of SS. Maurice and Lazare; Knight of the French Legion of Honour; Civic Cross of the 1st Class; Officer of the Academy of France; Associate of the Statistical Society of Paris and of the International Statistical Institute.

China.

1890	*d*	SIR ROBERT HART, Baronet, G.C.M.G., LL.D., **Peking.**

Inspector-General of Imperial Maritime Customs, China.

Denmark.

1878	*d*	VIGAND ANDREAS FALBE-HANSEN, **Copenhagen.**

Professor of Political Economy at the University of Copenhagen.

1852	*d*	DR. PETER ANTON SCHLEISNER, **Frederiksberg, Copenhagen.**

Doctor of Medicine, State Councillor; Knight and Bachelor of the Order of the "Dannebroge," and Knight of the Swedish Order of the North Star; President of the Royal Danish Institute of Vaccination; Member of the Royal Danish General Board of Health.

Year of Election.		France.
1880	d p	**DR. JACQUES BERTILLON, 1, Avenue Victoria, Paris.** Doctor of Medicine; Chief of the Statistical Department of the City of Paris; Member of the Superior Council of Statistics; of the Consultative Committee of Public Hygiene of France; of the Statistical Society of Paris; and of the International Statistical Institute, &c.
1856	d	**MAURICE BLOCK, 63, Rue de l'Assomption, Paris.** Knight of the Legion of Honour, and of Orders of Sweden, Russia, Prussia, Bavaria, Austria-Hungary, Greece, Italy, and Portugal; Member of the Institute of France, of the Superior Council of Statistics, of the International Statistical Institute, of the Society of Political Economy of Paris, and of many Academies and Scientific Societies.
1879	d	**DR. ARTHUR CHERVIN, 82, Avenue Victor Hugo, Paris.** Doctor of Medicine and Surgery; Director of the Paris Institute for Stammerers; Member of the Superior Council of Statistics and of the International Statistical Institute, &c.
1897	d	**JEAN JACQUES ÉMILE CHEYSSON, 4, Rue Adolphe Yvon, Paris.** Inspector-General of Bridges and Highways; Member of the International Statistical Institute; Past President of the Statistical Society of Paris; late Director of the Creusot Iron Works, of Machinery at the Paris Exhibition of 1867, and of Graphic Statistics for the Ministry of Public Works.
1878	d	**MAXIMIN DELOCHE, 5, Rue Herschel, Paris.** Honorary Director of the General Statistics of France; Commander of the Legion of Honour; Officer of the Order of Public Instruction; Commander of the Austrian Order of Francis Joseph; Member of the Institute of France, and of several learned Societies.
1890	d p	**ALFRED DE FOVILLE, Hotel des Monnaies, Paris.** Master of the Mint; Professor at the National Conservatoire of Arts and Trades (Chair of Industrial Economy and Statistics); Officer of the Legion of Honour; Member of the Institute of France; Past President of the Statistical Society of Paris; Member of the International Statistical Institute and of the Superior Council of Statistics.
1870	d	**DR. CLÉMENT JUGLAR, 167, Rue St. Jacques, Paris.** Member of the Institute of France; Past President of the Statistical Society of Paris; Vice-President of the Society of Political Economy of Paris; Member of the International Statistical Institute.

Year of Election.		
		Germany—*Contd.*
1893	*d*	DR. FRIEDRICH WILHELM HANS VON SCHEEL, **Lützow-Ufer, 6/8, Berlin, W.**

"Kaiserlicher Geheimer Regierungsrath;" Doctor *Juris et philosophiæ;* Director of the Imperial Statistical Bureau of the German Empire; formerly Professor of Political Economy and Statistics at the University of Bern; Honorary Member of the Statistical and Social Inquiry Society of Ireland; Member of the International Statistical Institute.

| 1860 | | DR. GEORG KARL LEOPOLD SEUFFERT, **Maximilian-splatz, Nr. 9/3, Munich.** |

Formerly Chief Inspector and Director of the Royal Custom-House at Simbach; Knight of the Bavarian Order of St. Michael 1st Class; Corresponding Member of the Central Statistical Commission of Belgium; Member of the "Freies Deutsches Hochstift zu Frankfurt a/M."

| 1897 | | DR. ADOLPH WAGNER, Ph.D, **51, Lessingstrasse, Berlin, N.W.** |

Professor of Political Economy at the University of Berlin; Member of the Statistical Bureau of Prussia, and of the International Statistical Institute.

| 1876 | *d* | THE PRESIDENT (for the time being) OF THE GEO-GRAPHICAL AND STATISTICAL SOCIETY OF FRANK-FORT, **Stadtbibliothek, Frankfort.** |

Italy.

| 1879 | *d* | DR. GEROLAMO BOCCARDO, **Piazzia Santi Apostoli, 74, Rome.** |

Senator; Councillor of State; Doctor of Laws; late Professor at the University and at the Superior Naval School of Genoa; Grand Officer of the Orders of SS. Maurice and Lazare, and of the Crown of Italy; Knight of the Order of Civil Merit of Savoy; Member of the Academy "dei Lincei," of the Academy of Naples, of the Institutes of Science of Milan, Venice, and Palermo, of the Cobden Club, of the International Statistical Institute, of the Academy of Madrid, and of the Deputation of National History, &c.

| 1874 | *d* | DR. LUIGI BODIO, **193, Via Torino, Rome.** |

Doctor of Laws; Professor of Industrial Legislation and of Statistics at the Engineering College, Rome; Councillor of State; President of the Royal Board of Statistics of the Kingdom of Italy; Secretary of the International Statistical Institute; Grand Officer of the Order of SS. Maurice and Lazare; Knight of the Order of Civil Merit of Savoy; Correspondent of the Institute of France (Academy of Moral and Political Sciences).

Year of Election.		Italy—*Contd.*
1845	*d*	FRANCESCO FERRARA, **Venice.**

1845   *d*   **FRANCESCO FERRARA, Venice.**
Senator; Professor and Director of the Royal Superior School of Commerce at Venice; late Minister of Finance; Member of the Academy "dei Lincei;" Honorary Member of the International Statistical Institute.

1899   *d*   **DR. CARLO FRANCESCO FERRARIS, Padua.**
Professor of Administrative Science and Law, and of Statistics at the Royal University of Padua; Member of the Superior Council of Statistics and of the Superior Council of Public Education of Italy; Member of the Academy "dei Lincei," of the Royal Institute of Science at Venice, of the International Statistical Institute, and Honorary Member of the Swiss Statistical Society; Ex-Member of the Italian Parliament.

1880   *d*   **ANGELO MESSEDAGLIA, Rome.**
Senator; Professor of Statistics at the Royal University of Rome; Member of the Academy "dei Lincei"; Knight of the Order of Civil Merit of Savoy: Member of the International Statistical Institute; President of the Commission for Judicial Statistics.

Mexico.

1895   *d*   **DON MANUEL FERNANDEZ LEAL, Mexico.**
Secretary of State, Department of "Fomento," Colonization and Industry.

Netherlands.

1896   *d*   **DR. NICOLAAS GERARD PIERSON, The Hague.**
Minister of Finance; Late President of the Netherlands' Bank; Late Professor of Political Economy at the University of Amsterdam; Member of the International Statistical Institute.

1893   *d*   **DR. VERKERK WILLIAM ARNOLD PETER PISTORIUS, The Hague.**
Resident Minister, Secretary General to the Ministry of Foreign Affairs.

Roumania.

1896   *d*   **GRÉGOIRE P. OLANESCO, Rue Grivitza 36, Bucharest.**
Late Director-General of Customs; Late General Secretary, Ministry of Finance; Officer of the Legion of Honor; Member of the International Statistical Institute.

Year of Election.		

Russia.

1873   *d*   HIS EXCELLENCY PIERRE SEMENOV, **St. Petersburg.**
Senator; Privy Councillor to His Imperial Majesty; President of the Imperial Statistical Council; President of the Imperial Geographical Society; Honorary Member of the Academy of Sciences in St. Petersburg; Associate of the Statistical Society of Paris.

1890   *d*   HIS EXCELLENCY NICOLAS TROÏNITSKY, **Kovenskoy-pereoulok, Nr 9, St. Petersburg.**
Former Governor; Privy Councillor; Director of the Central Statistical Committee of the Ministry of the Interior; Life Member of the Statistical Council, of the Imperial Geographical Society of Russia, and of the International Statistical Institute, and Member of the Statistical Society of Paris.

Spain.

1845   HIS EXCELLENCY SEÑOR DON JOSÉ MAGAZ Y JAYME, **Calle de Leon, 13, Madrid.**
Advocate, Gentleman of His Majesty's Chamber, and Member of the Council of State; Ex-Deputy of the Cortes; Ex-Senator; Ex-Director-General of Treasury; Ex-Under-Secretary of the Ministry of Finance; Grand Cross of the Order of Isabella Catolica; Commander of the Order of Carlos 3º.

Sweden and Norway.

1858   *d*   DR. THORKIL HALVORSEN ASCHEHOUG, **41, Josephine-gade Christiania.**
Doctor of Laws; Professor of Political Economy at the University of Christiania; Assessor Extraordinary of the Supreme Court of Norway; Commander of the First Class of the Norwegian Order of St. Olave, of the Swedish Order of the North Star; and of the Danish Order of the " Dannebroge;" Corresponding Member of the Institute of France; Member of the Institute of International Law, of the International Statistical Institute, and of the Academies of Christiania, Stockholm, Trondhjem and Upsala, also of the Royal Historical Society of Denmark.

1874   *d*   ANDERS NICOLAI KIÆR, **Christiania.**
Director of the Central Statistical Bureau of Norway; Associate of the Statistical Society of Paris; Member of the International Statistical Institute.

1890   *d*   DR. ELIS SIDENBLADH., Ph.D., **Stockholm.**
Director in Chief of the Central Statistical Bureau of Sweden; President of the Royal Statistical Commission; Commander, Officer, and Knight of several Swedish and Foreign Orders; Member of the Royal Academies of Sciences and of Agriculture, at Stockholm, of the International Statistical Institute, and Honorary and Corresponding Member of several foreign learned Societies.

Year of Election.		

Switzerland.

1890 | *d* | DR. LOUIS GUILLAUME, **Bern.**
Doctor of Medicine; Director of the Federal Statistical Bureau; Secretary of the International Penitentiary Commission; Member of the International Statistical Institute.

United States.

1873 | | THE HON. WILLIAM BARNES, **Thurlow-terrace, Albany, N.Y.**
Lawyer; Ex-Superintendent of the Insurance Department, State of New York.

1881 | *d* | DR. JOHN SHAW BILLINGS, **New York Public Library, New York City.**
M.A., M.D., LL.D., Edinburgh and Harvard; D.C L., Oxon; Surgeon, U.S. Army; Member of the National Academy of Sciences, of the International Statistical Institute, &c.

1896 | *d* | WORTHINGTON CHAUNCEY FORD, **Haddon Hall, Commonwealth Avenue, Boston, Mass.**
Late Chief of the Bureau of Statistics, Treasury Department; Chief of the Bureau of Statistics, Department of State; Member of the International Statistical Institute.

1890 | *d* | DR. RICHMOND MAYO-SMITH, M.A., Ph.D., **Columbia College, New York.**
Professor of Political Economy and Social Science in Columbia College; Vice-President of the American Statistical Association; Member of the International Statistical Institute, and of the National Academy of Sciences.

1870 | | THE HON. JOHN ELIOT SANFORD, **Taunton, Mass.**
Lawyer; Ex-Speaker of the House of Representatives; Ex-Insurance Commissioner; Ex-Chairman of the Board of Harbour and Land Commissioners; Chairman of the Board of Railroad Commissioners.

1893 | *d* | THE HON. CARROLL DAVIDSON WRIGHT, M.A., LL.D., **Washington.**
Commissioner of the U.S. Department of Labour; late Chief of the Massachusetts Bureau of Statistics of Labour; President of the Association for the promotion of Profit Sharing; late President and now Vice-President of the American Social Science Association; President of the American Statistical Association; Member of the American and British Economic Associations, of the International Statistical Institute; Hon. Member of the Russian Imperial Academy of Sciences; Corresponding Member of the Institute of France; and Member of several other learned Societies.

1877 | *d* | DR. EDWARD YOUNG, M.A., Ph.D., **207, Maryland Avenue, N.E., Washington, U.S.A.**
Late Consul of the United States; formerly Chief of the Bureau of Statistics, United States of America; Member of the Geographical Society of Paris.

Year of Election.		

India.

1886   *d*   JAMES EDWARD O'CONOR, C.I.E., **Calcutta and Simla.**
Director-General of Statistics ; Assistant Secretary with the
Supreme Government, India, Department of Finance and
Commerce ; Member of the International Statistical
Institute.

Dominion of Canada.

1894   *d*   GEORGE JOHNSON, **Ottawa.**
Statistician, Department of Agriculture, Ottawa, Canada.

New South Wales.

1893   *d p*   TIMOTHY AUGUSTINE COGHLAN, **Sydney.**
Government Statistician of New South Wales ; Member of
the Public Science Board ; formerly Registrar of Friendly
Societies and Trade Unions ; and Assistant Engineer for
Harbours and Rivers.

New Zealand.

1876   *d*   SIR JAMES HECTOR, K.C.M.G., M.D., F.R.S.S. L. and E.,
F.G.S., &c., **Wellington.**
Director of the Geological Survey, of the Meteorological
Department, and of the New Zealand Institute, &c.

Tasmania.

1894   *d*   ROBERT MACKENZIE JOHNSTON, **Hobart.**
Registrar-General and Government Statistician ; Fellow and
Member of Council of the Royal Society of Tasmania ;
Member of Council and of Senate of the University of
Tasmania ; Fellow and Past President of Section F
(*Economics* and *Statistics*) of the Australasian Association
for the Advancement of Science ; Fellow of the Royal
Geographical Society of Australia ; Honorary Foreign
Corresponding Member of the Geological Society of
Edinburgh ; Fellow of the Linnean Society of London.

1876   *d p*   EDWIN CRADOCK NOWELL, J.P., **Hobart.**
Clerk of Executive and Legislative Councils of Tasmania ;
late Government Statistician ; Clerk to the Federal Council
of Australasia in its four Sessions.

Victoria.

1858   *d*   WILLIAM HENRY ARCHER, K.C.P., K.S.G., F.I.A., F.L.S.,
&c., **Grace Park, Hawthorne, Melbourne.**
Barrister-at-Law.

Year of Election.		Great Britain and Ireland.
1876	*d*	THE PRESIDENT (for the time being) OF THE MAN-CHESTER STATISTICAL SOCIETY, **63, Brown Street, Manchester.**
1876	*d*	THE PRESIDENT (for the time being) OF THE STA-TISTICAL AND SOCIAL INQUIRY SOCIETY OF IRELAND, **35, Molesworth Street, Dublin.**

NOTE.—The Executive Committee request that any inaccuracies in the foregoing List of HONORARY FELLOWS may be pointed out, and that all changes of address may be notified to the Assistant Secretary, so that delay in forwarding communications and the publications of the Society may be avoided.

ROYAL STATISTICAL SOCIETY.

Copy of Charter.

Victoria, by the Grace of God of the United Kingdom of Great Britain and Ireland Queen, Defender of the Faith.

To all to whom these Presents shall come, Greeting :—

Whereas Our Right trusty and entirely beloved cousin, Henry, Third Marquess of Lansdowne, Knight of the Most Noble Order of the Garter, Charles Babbage, Fellow of the Royal Society, John Elliott Drinkwater, Master of Arts, Henry Hallam, Fellow of the Royal Society, the Reverend Richard Jones, Master of Arts, and others of Our loving subjects, did, in the year One thousand eight hundred and thirty-four, establish a Society to collect, arrange, digest and publish facts, illustrating the condition and prospects of society in its material, social, and moral relations ; these facts being for the most part arranged in tabular forms and in accordance with the principles of the numerical method, and the same Society is now called or known by the name of " The " Statistical Society."

And Whereas it has been represented to Us that the same Society has, since its establishment, sedulously pursued such its proposed objects, and by its publications (including those of its transactions), and by promoting the discussion of legislative and other public measures from the statistical point of view, has greatly contributed to the progress of statistical and economical science.

And Whereas distinguished individuals in foreign countries, as well as many eminent British subjects, have availed themselves of the facilities offered by the same Society for communicating important information largely extending statistical knowledge ; and the general interest now felt in Statistics has been greatly promoted and fostered by this Society.

And Whereas the same Society has, in aid of its objects, collected a large and valuable library of scientific works and charts, to which fresh accessions are constantly made ; and the said Society has hitherto been supported by annual and other subscriptions and contributions to its funds, and has lately acquired leasehold premises in which the business of the said Society is carried on.

And Whereas in order to secure the property of the said Society, to extend its operations, and to give it its due position among the Scientific Institutions of Our kingdom, We have been besought to grant to Sir Rawson William Rawson, Knight Com-

mander of the Most Distinguished Order of St. Michael and St. George, and Companion of the Most Honourable Order of the Bath, and to those who now are Members of the said Society, or who shall from time to time be elected Fellows of the Royal Statistical Society hereby incorporated, Our Royal Charter of Incorporation for the purposes aforesaid.

1. **Now Know Ye** that We, being desirous of encouraging a design so laudable and salutary, of Our especial grace, certain knowledge and mere motion, have willed, granted, and declared and Do by these Presents, for Us, Our heirs and successors, will, grant, and declare that the said Sir Rawson William Rawson, Knight Commander of the Most Distinguished Order of St. Michael and St. George, and Companion of the Most Honourable Order of the Bath, and such other of Our loving subjects as now are Members of the said Society, or shall from time to time be elected Fellows of " The Royal Statistical Society " hereby incorporated according to such regulations or bye laws as shall be hereafter framed or enacted, and their successors, shall for ever hereafter be by virtue of these presents one body politic and corporate, by the name of " **The Royal Statistical Society,**" and for the purposes aforesaid, and by the name aforesaid, shall have perpetual succession and a common seal, with full power and authority to alter, vary, break, and renew the same at their discretion, and by the same name to sue and be sued, implead and be impleaded, answer and be answered, unto and in every Court of Us, Our heirs and successors.

2. **The** Royal Statistical Society, in this Charter hereinafter called " The Society," may, notwithstanding the statutes of mortmain, take, purchase, hold and enjoy to them and their successors a hall, or house, and any such messuages or hereditaments of any tenure as may be necessary, for carrying out the purposes of the Society, but so that the yearly value thereof to be computed at the rack rent which might be gotten for the same at the time of the purchase or other acquisition, and including the site of the said hall, or house, do not exceed in the whole the sum of Two thousand pounds.

3. **There** shall be a Council of the Society, and the said Council and General Meetings of the Fellows to be held in accordance with this Our Charter shall, subject to the provisions of this Our Charter, have the entire management and direction of the concerns of the Society.

4. **There** shall be a President, Vice-Presidents, a Treasurer or Treasurers, and a Secretary or Secretaries of the Society. The Council shall consist of the President, Vice-Presidents, and not

less than twenty Councillors; and the Treasurer or Treasurers and the Secretary or Secretaries if honorary.

5. **The** several persons who were elected to be the President, Vice-Presidents, and Members of the Council of the Statistical Society at the Annual Meeting held in the month of June, One thousand eight hundred and eighty-six, shall form the first Council of the Society, and shall continue in office until the first Election of officers is made under these presents as hereinafter provided.

6. **General** Meetings of the Fellows of the Society may be held from time to time, and at least one General Meeting shall be held in each year. Every General Meeting may be adjourned, subject to the provisions of the Bye Laws. The following business may be transacted by a General Meeting, viz.:—

(*a.*) The Election of the President, Vice-Presidents, Treasurer or Treasurers, Secretary or Secretaries, and other Members of the Council of the Society.

(*b.*) The making, repeal, or amendment of Bye Laws.

(*c.*) The passing of any proper resolution respecting the affairs of the Society.

7. **Bye Laws** of the Society may be made for the following purposes, and subject to the following conditions, viz.:—

(*a.*) For prescribing the qualification and condition of tenure of office of the President; the number, qualifications, functions, and conditions of tenure of office of the Vice-Presidents, Treasurers, Secretaries, and Members of Council, and Officers of the Society; for making regulations with respect to General Meetings and Meetings of the Council and proceedings thereat, and for the election of any persons to be Honorary Fellows or Associates of the Society, and defining their privileges (but such persons, if elected, shall not be Members of the Corporation), and for making regulations respecting the making, repeal and amendment of Bye Laws, and generally for the government of the Society and the management of its property and affairs.

(*b.*) The first Bye Laws shall be made at the first General Meeting to be held under these presents, and shall (amongst other things) prescribe the time for holding the first election of officers under these presents.

8. **The** General Meetings and adjourned General Meetings of the Society shall take place (subject to the rules or bye laws of the Society, and to any power of convening or demanding a

Special General Meeting thereby given) at such times and places as may be fixed by the Council.

9. **The** existing rules of the Statistical Society, so far as not inconsistent with these presents, shall be in force as the Bye Laws of the Society until the first Bye Laws to be made under these presents shall come into operation.

10. **Subject** to these presents and the Bye Laws of the Society for the time being, the Council shall have the sole management of the income, funds, and property of the Society, and may manage and superintend all other affairs of the Society, and appoint and dismiss at their pleasure all salaried and other officers, attendants, and servants as they may think fit, and may do all such things as shall appear to them necessary or expedient for giving effect to the objects of the Society.

11. **The** Council shall once in every year present to a General Meeting a report of the proceedings of the Society, together with a statement of the receipts and expenditure, and of the financial position of the Society, and every Fellow of the Society may, at reasonable times to be fixed by the Council, examine the accounts of the Society.

12. **The** Council may, with the approval of a General Meeting, from time to time appoint fit persons to be Trustees of any part of the real or personal property of the Society, and may make or direct any transfer of such property so placed in trust necessary for the purposes of the trust, or may, at their discretion, take in the corporate name of the Society conveyances or transfers of any property capable of being held in that name. Provided that no sale, mortgage, incumbrance, or other disposition of any hereditaments belonging to the Society shall be made unless with the approval of a General Meeting.

13. **No** Rule, Bye Law, Resolution, or other proceeding shall be made or had by the Society, or any meeting thereof, or by the Council, contrary to the general scope or true intent and meaning of this Our Charter, or the laws or statutes of Our Realm, and anything done contrary to this present clause shall be void.

In witness whereof We have caused these Our Letters to be made Patent.

Witness Ourself, at Westminster, the thirty-first day of January, in the fiftieth year of Our Reign.

By Warrant under the Queen's Sign Manual,

(L. S.)

MUIR MACKENZIE.

ROYAL STATISTICAL SOCIETY.

Index to Bye-Laws.

BYE-LAWS OF THE ROYAL STATISTICAL SOCIETY.

Objects of the Society.

1. The objects of the Royal Statistical Society are to collect, arrange, digest and publish facts, illustrating the condition and prospects of society in its material, social and moral relations; these facts being for the most part arranged in tabular forms and in accordance with the principles of the numerical method.

The Society collects new materials, condenses, arranges, and publishes those already existing, whether unpublished or published in diffuse and expensive forms in the English or in any foreign language, and promotes the discussion of legislative and other public measures from the statistical point of view. These discussions form portions of the published Transactions of the Society.

Constitution of the Society.

2. The Society consists of Fellows and Honorary Fellows, elected in the manner hereinafter described.

Number of Fellows and Honorary Fellows.

3. The number of Fellows is unlimited. Foreigners or British subjects of distinction residing out of the United Kingdom may be admitted as Honorary Fellows, of whom the number shall not be more than seventy at any one time.

Proposal of Fellows.

4. Every Candidate for admission as a Fellow of the Society shall be proposed by two or more Fellows, who shall certify from their personal knowledge of him or of his works, that he is a fit person to be admitted a Fellow of the Society. Every such certificate having been read and approved of at a Meeting of the Council, shall be suspended in the office of the Society until the following Ordinary Meeting, at which the vote shall be taken.

Election of Fellows.

5. In the election of Fellows, the votes shall be taken by ballot. No person shall be admitted unless at least sixteen Fellows vote, and unless he have in his favour three-fourths of the Fellows voting.

Admission of Fellows.

6. Every Fellow elect is required to take the earliest opportunity of presenting himself for admission at an Ordinary Meeting of the Society.

The manner of admission shall be thus :—

Immediately after the reading of the minutes, the Fellow elect, having first paid his subscription for the current year or his composition, shall sign the obligation contained in the Fellowship-book, to the effect following:—

" We, who have underwritten our " names, do hereby undertake, each for " himself, that we will endeavour to " further the good of the Royal Statis- " tical Society for improving Statistical " Knowledge, and the ends for which " the same has been founded; that we " will be present at the Meetings of the " Society as often as conveniently we " can, and that we will keep and fulfil " the Bye-laws and Orders of this " Society: provided that whensoever " any one of us shall make known, by " writing under his hand, to the Secre- " taries for the time being, that he " desires to withdraw from the Society, " he shall be free thenceforward from " this obligation."

Whereon the President, taking him by the hand, shall say,—" By the " authority, and in the name of the " Royal Statistical Society, I do admit " you a Fellow thereof."

Upon their admission Fellows shall have the right of attaching to their names the letters F.S.S., but not in connection with any trading or business advertisement other than the publication of any book or literary notice.

Admission of Honorary Fellows.

7. There shall be Two Meetings of the Society in the year, on such days as shall be hereafter fixed by the Council, at which Honorary Fellows may be elected.

No Honorary Fellow can be recommended for election but by the Council. At any Meeting of the Council any Member thereof may propose a Foreigner or

British subject of distinction residing out of the United Kingdom, delivering at the same time a written statement of the qualifications of, offices held by, and published works of, the person proposed; and ten days' notice at least shall be given to every Member of the Council, of the day on which the Council will vote by ballot on the question whether they will recommend to the Society the election of the person proposed. No such recommendation to the Society shall be adopted unless at least three-fourths of the votes are in favour thereof.

Notice of the recommendation shall be given from the chair at the Meeting of the Society next preceding that at which the vote shall be taken thereon. No person shall be elected an Honorary Fellow unless sixteen Fellows vote and three-fourths of the Fellows voting be in his favour.

The Council shall have power to elect as Honorary Fellows, the Presidents for the time being of the Statistical Societies of Dublin, Manchester, and Paris, and the President of any other Statistical Society at home or abroad.

Payments by Fellows.

8. Every Fellow of the Society shall pay a yearly subscription of Two Guineas, or may at any time compound for his future yearly payments by paying at once the sum of Twenty Guineas,* unless the Annual Subscription or Composition Fee shall be remitted by the Council; provided that the number of Fellows whose Annual Subscription or Composition Fee shall have been thus remitted, do not exceed five at any one time.

Every person elected to the Society shall pay his first subscription (or if he desire to become a Life Fellow, his composition) within three months at the latest of the date of his election, if he be resident in the United Kingdom. If he be resident abroad, this period shall be six months. If payment be not made within the time specified above, the election shall be void.

Defaulters.— Withdrawal of Fellows.

9. All yearly payments are due in advance on the 1st of January, and if any Fellow of the Society have not paid his subscription before the 1st of July, he shall be applied to in writing by the Secretaries, and if the same be not paid before the 1st of January of the second year, a written application shall again be made by the Secretaries, and the Fellow in arrear shall cease to receive the Society's publications, and shall not be entitled to any of the privileges of the Society until such arrears are paid; and if the subscription be not discharged before the 1st of February of the second year, the name of the Fellow thus in arrear shall be exhibited on a card suspended in the office of the Society; and if, at the next Annual General Meeting, the amount still remain unpaid, the defaulter shall, unless otherwise authorised by the Council, be announced to be no longer a Fellow of the Society, the reason for the same being at the same time assigned. No Fellow of the Society can withdraw his name from the Society's books, unless all arrears be paid; and no resignation will be deemed valid unless a written notice thereof be communicated to the Secretaries. No Fellow shall be entitled to vote at any Meeting of the Society until he shall have paid his subscription for the current year.

Expulsion of Fellows.

10. If any Fellow of the Society, or any Honorary Fellow, shall so demean himself that it would be for the dishonour of the Society that he longer continue to be a Fellow or Honorary Fellow thereof, the Council shall take the matter into consideration; and if the majority of the Members of the Council present at some Meeting (of which and of the matter in hand such Fellow or Honorary Fellow, and every Member of the Council, shall have due notice) shall decide by ballot to recommend that such Fellow or Honorary Fellow be expelled from the Society, the President shall at its next Ordinary Meeting announce to the Society the recommendation of the Council, and at the following Meeting the question shall be decided by ballot, and if at least three-fourths of the

* Cheques should be made payable to "The Royal Statistical Society," and crossed "Messrs. "Drummond and Co."

number voting are in favour of the expulsion, the President shall forthwith cancel the name in the Fellowship-book, and shall say,—

" By the authority and in the name " of the Royal Statistical Society, I do " declare that A. B. (naming him) is no " longer a Fellow (or Honorary Fellow) " thereof."

And such Fellow or Honorary Fellow shall thereupon cease to be of the Society.

Trustees.

11. The property of the Society may be vested in three Trustees, chosen by the Fellows. The Trustees are eligible to any other offices in the Society.

President, Council, and Officers.

12. The Council shall consist of a President and thirty Members, together with the Honorary Vice-Presidents.

From the Council shall be chosen four Vice-Presidents, a Treasurer, the Honorary Secretaries, and a Foreign Secretary, who may be one of the Honorary Secretaries. The former Presidents who are continuing Fellows of the Society shall be Honorary Vice-Presidents. Any five of the Council shall be a quorum.

Election of President and Officers.

13. The President, Members of Council, Treasurer, and Honorary and Foreign Secretaries shall be chosen annually by the Fellows at the Annual General Meeting.

The Vice-Presidents shall be chosen annually from the Council by the President.

The President shall not be eligible for the office more than two years in succession.

Six Fellows, at least, who were not of the Council of the previous year, shall be annually elected; and of the Members retiring three at least shall be those who have served longest continuously on the Council, unless they hold office as Treasurer or Honorary or Foreign Secretary.

Nomination of President, Council, and Officers.

14. The Council shall, previously to the Annual General Meeting, nominate, by ballot, the Fellows whom they recommend to be the next President and Council of the Society. They shall also recommend for election a Treasurer and the Secretaries (in accordance with Rule 12). Notice shall be sent to every Fellow whose residence is known to be within the limits of the metropolitan post, at least a fortnight before the Annual General Meeting, of the names of Fellows recommended by the Council.

Extraordinary Vacancies.

15. On any extraordinary vacancy occurring of the Office of President, or other Officer of the Society, the Honorary Secretaries shall summon the Council with as little delay as possible, and a majority of the Council, thereupon meeting in their usual place, shall, by ballot, and by a majority of those present, choose a new President, or other Officer of the Society, to be so until the next Annual General Meeting.

Committees.

16. The Council shall have power to appoint Committees of Fellows and also an Executive Committee of their own body. The Committees shall report their proceedings to the Council. No report shall be communicated to the Society except by the Council.

Auditors.

17. At the first Ordinary Meeting of each year, the Fellows shall choose two Fellows, not being Members of the Council, as Auditors, who, with one of the Council, chosen by the Council, shall audit the Treasurer's accounts for the past year, and report thereon to the Society, which report shall be presented at the Ordinary Meeting in February. The Auditors shall be empowered to examine into the particulars of all expenditure of the funds of the Society, and may report their opinion upon any part of it.

Meetings Ordinary and General.

18. The Ordinary Meetings of the Society shall be held monthly, or oftener, during the Session, which shall be from the 1st of November to the 1st of July in each year, both inclusive, on such days and at such hours as the Council shall declare. The Annual General Meeting shall be held on such day in the month of June of each year as shall be appointed by the Council for the time being.

Business of Ordinary Meetings.

19. The business of the Ordinary Meetings shall be to elect and admit Fellows, to read and hear reports, letters, and papers on subjects interesting to the Society. Nothing relating to the bye-laws or management of the Society shall be discussed at the Ordinary Meetings, except that the Auditors' Report shall be presented at the Ordinary Meeting in February, and that the Minutes of the Annual General Meeting, and of every Special General Meeting, shall be submitted for confirmation at the next Ordinary Meeting after the day of such Annual or Special General Meeting. Strangers may be introduced to the Ordinary Meetings, by any Fellow, with the leave of the President, Vice-President, or other Fellow presiding at the Meeting.

Business of Annual General Meeting.

20. The business of the Annual General Meeting shall be to elect the Officers of the Society, and to discuss questions on its bye-laws and management. No Fellow or Honorary Fellow shall be proposed at the Annual General Meeting. No Fellow shall propose any alteration of the rules or bye-laws of the Society at the Annual General Meeting, unless after three weeks' notice thereof given in writing to the Council, but amendments to any motion may be brought forward without notice, so that they relate to the same subject as the motion. The Council shall give fourteen days' notice to every Fellow of all questions of which such notice shall have been given to them.

Special General Meetings

21. The Council may, at any time, call a Special General Meeting of the Society when it appears to them necessary. Any twenty Fellows may require a Special General Meeting to be called, by notice in writing signed by them, delivered to one of the Secretaries, specifying the questions to be moved. The Council shall, within one week of such notice, appoint a day for such Special General Meeting, and shall give at least one week's notice of every Special General Meeting, and of the questions to be moved, to every Fellow

within the limits of the metropolitan post, whose residence is known. No business shall be brought forward at any Special General Meeting other than that specified in the notice convening the same.

Duties of the President.

22. The President shall preside at all Meetings of the Society, Council, and Committees which he shall attend, and in case of an equality of votes, shall have a second or casting vote. He shall sign all diplomas of admission of Honorary Fellows. He shall admit and expel Fellows and Honorary Fellows, according to the bye-laws of the Society.

Duties of the Treasurer.

23. The Treasurer shall receive all moneys due to, and pay all moneys owing by, the Society, and shall keep an account of his receipts and payments. No sum exceeding Ten Pounds shall be paid but by order of the Council, excepting always any lawful demand for rates or taxes. The Treasurer shall invest the moneys of the Society in such manner as the Council shall from time to time direct.

Duties of the Honorary Secretaries.

24. The Honorary Secretaries shall, under the control of the Council, conduct the correspondence of the Society ; they or one of them shall attend all Meetings of the Society and Council, and shall duly record the Minutes of the Proceedings. They shall issue the requisite notices, and read such papers to the Society as the Council may direct.

Powers of the Vice-Presidents.

25. A Vice-President, whether Honorary or nominated, in the chair, shall act with the power of the President in presiding and voting at any Meeting of the Society or Council, and in admitting Fellows; but no Vice-President shall be empowered to sign diplomas of admission of Honorary Fellows, or to expel Fellows or Honorary Fellows. In the absence of the President and Vice-Presidents, any Member of Council may be called upon by the Fellows then present, to preside at an Ordinary or Council Meeting, with the same power as a Vice-President.

Powers of the Council.

26. The Council shall have control over the papers and funds of the Society, and may, as they shall see fit, direct the publication of papers and the expenditure of the funds, in accordance with the provisions of the Charter.

27. The Council shall be empowered at any time to frame Regulations not inconsistent with these bye-laws, which shall be and remain in force until the next Annual General Meeting, at which they shall be either affirmed or annulled; but no Council shall have power to renew Regulations which have once been disapproved at an Annual General Meeting.

28. The Council shall have the custody of the Common Seal. The Common Seal shall not be affixed to any instrument, deed, or other document, except by order of the Council and in the presence of at least two Members of the Council and in accordance with such other regulations as the Council shall from time to time prescribe. The fact of the seal having been so affixed shall be entered on the minutes of the Council.

29. No Dividend, Gift, Division, or Bonus in money shall be made by the Society, unto or between any of the Fellows or Members, except as hereinafter provided.

30. The Council shall publish a Journal of the Transactions of the Society, and such other Statistical Publications as they may determine upon, and may from time to time pay such sums to Editors and their assistants, whether Fellows of the Society or not, as may be deemed advisable.

31. All communications to the Society are the property of the Society, unless the Council allow the right of property to be specially reserved by the Contributors.

REGULATIONS OF THE LIBRARY.

1. The Library and the Reading Room are open daily for the use of Fellows from 10 a.m. till 5 p.m., except on Saturdays, when they are closed at 2 p.m.

2. Fellows of the Society are permitted to take out Books on making personal application, or by letter addressed to the Librarian, all expenses for carriage being paid by the Fellows.

3. Fellows are not to keep any books longer than one month. Any Fellow detaining a book for more than a month shall not be permitted to take another from the Library until the book detained shall have been returned.

On the termination of the year for which the subscription has not been paid, a Fellow whose payment is in arrear shall cease to have the privilege of using the Library or of borrowing books therefrom.

4. Scientific Journals and Periodicals are not circulated until the volumes are completed and bound.

5. Cyclopædias and works of reference are not circulated, but may be lent on the written order of an Honorary Secretary for a period not exceeding *seven* days. The Assistant Secretary or Librarian is allowed at his discretion to lend works of reference for a period not exceeding *three* days, reporting at the same time to the Honorary Secretaries. If works so lent be not returned within the specified time, the borrower shall incur a fine of one shilling per day per volume for each day they are detained beyond the time specified.

6. Any Fellow who damages or loses a book, shall either replace the work, or pay a fine equivalent to its value.

7. Books taken from the shelves for reference, are *not* to be replaced, but must be laid on the Library table.

8. The Librarian shall report to the Council any infringement of these regulations, and lay upon the table at each regular Meeting (*a*) a List of any "Works of Reference" that may have been borrowed, and (*b*) a List of Books that have been out more than a month.

DONORS TO THE LIBRARY.

DURING THE YEAR (ENDING 15TH SEPTEMBER) 1899.

(a) Foreign Countries.

Argentine Republic—
General Statistical Bureau.
National Health Department.
Buenos Ayres, Provincial and Municipal Statistical Bureaus.

Austria and Hungary—
Central Statistical Commission.
Ministry of Agriculture.
Statistical Department of the Ministry of Commerce.
Austrian Labour Department.
Bohemian Statistical Bureau.
Bosnia and Herzegovina Statistical Bureau.
Bukowina Statistical Bureau.
Hungarian Statistical Bureau.
Brünn Statistical Bureau.
Budapest Statistical Bureau.
Prague Statistical Bureau.

Belgium—
Army Medical Department.
Bureau of General Statistics.
Administration of Mines.
Belgian Labour Department.
Brussels Bureau of Hygiene.
Hasselt, The Burgomaster.
Royal Academy of Sciences.
La Belgique Coloniale, The Editor.

Bulgaria. Statistical Bureau.

China. Imperial Maritime Customs.

Denmark—
Royal Statistical Bureau.
Copenhagen Statistical Bureau.
Political Economy Society.

Egypt—
Department of Public Health.
Director-General of Customs.
        "   Post Office.
Ministry of Finance.
Egyptian Institute, Cairo.
Comité de Conservation des Monuments de l'Art Arabe.

France—
Director-General of Customs.
Director of the Mint.
French Labour Department.
Ministry of Agriculture.
    "   Finance.
    "   The Interior.
    "   Justice.
    "   Public Works.
Paris Statistical Bureau.
Economiste Français, The Editor.
Journal des Economistes, The Editor.
Monde Economique, The Editor.
Polybiblion, Revue Bibliographique Universelle, The Editor.
Réforme Sociale, The Editor.
Rentier, Le, The Editor.
Revue d'Economie Politique, The Editor.
Revue Géographique Internationale, The Editor.
Revue de Statistique, The Publisher.
Statistical Society of Paris.
Free School of Political Science.
Musée Social, Paris.

Germany—
  Imperial Health Bureau.
      ,,   Insurance Bureau.
      ,,   Judicial Bureau.
      ,,   Statistical Bureau.
  German Consul-General, London.
  Prussian Royal Statistical Bureau.
  Saxony Royal Statistical Bureau.
  Berlin Statistical Bureau.
  Dresden Statistical Bureau.
  Frankfort Chamber of Commerce.
  Frankfort Statistical Bureau.
  Hamburg Statistical Bureau.
  Hanover Statistical Bureau.
  Allgemeines Statistisches Archiv, The Editor.
  Archiv für Soziale Gesetzgebung, &c., The Editor.
  Jahrbuch für Gesetzgebung, &c., The Editor.
  Jahrbücher für Nationalökonomie und Statistik, The Editor.
  Zeitschrift für die gesamte Staatswissenschaft, The Editor.
  Zeitschrift für Socialwissenschaft, The Editor.
  Geographical and Statistical Society of Frankfort.

Greece. Statistical Bureau.

Guatemala. Statistical Bureau.

Italy—
  Director-General of Statistics.
          ,,   Agriculture.
          ,,   Customs.
  Economista, The Editor.
  Giornale degli Economisti, The Editor.
  Rivista Italiana di Sociologia, The Editor.

Japan—
  Agricultural and Commercial Department.
  Bureau of General Statistics.

Mexico. Statistical Bureau.

Netherlands—
  Central Statistical Commission.
  Department of the Interior.
          ,,   Finance.
  Director-General of Customs.

Norway—
  Central Statistical Bureau.
  Christiania Health Department.

Portugal. General Statistical Bureau.

Roumania—
  Statistical Bureau.
  Bucharest Statistical Bureau.

Russia—
  Central Statistical Committee.
  Controller of the Empire.
  Customs Statistical Bureau.
  Department of Agriculture.
  Ministry of Finance.
  Bulletin russe de Statistique financière, The Editor.
  Finland Statistical Bureau.
  Société imperiale libre économique.

Servia. Statistical Bureau.

Spain—
  Director-General of Customs.
  Statistical Bureau of Madrid.
  Geographical Soc. of Madrid.

Sweden—
  Central Statistical Bureau.
  Stockholm Health Department.
  Royal University of Upsala.

Switzerland—

　Federal Assurance Bureau.
　　　　,,　　Statistical Bureau.
　　　　,,　　Department of Customs.
　Statistical Society.
　Swiss Union of Commerce and
　　Industry.
　Aargau Statistical Bureau.
　Geneva Public Library.

United States—

　Bureau of Education.
　　　　,,　　Ethnology.
　　　　,,　　Foreign Commerce.
　Commissioner of Labor.
　Comptroller of the Currency.
　Department of Agriculture.
　Director of Geological Survey.
　Director of the Mint.
　Interstate Commerce Commission.
　Naval Observatory.
　Secretary of the Treasury.
　　　　,,　　　　Interior.
　Surgeon-General, U. States Army.
　Statistical Bureau, Treasury.
　Connecticut—
　　State Board of Health.
　　Bureau of Labor Statistics.
　Illinois.　Bureau of Labor Sta-
　　tistics.
　Indiana.　Bureau of Labor
　　Statistics.
　Iowa.　Bureau of Labor Statistics.
　Kansas.　Bureau of Labor Sta-
　　tistics.
　Maine.　Bureau of Labor and In-
　　dustrial Statistics.
　Maryland.　Bureau of Industrial
　　Statistics.
　Massachusetts—
　　Board of Arbitration.
　　　　,,　　Health, Lunacy, &c.
　　Bureau of Labor Statistics.

United States—*Contd.*

　Michigan—
　　Bureau of Labor and Indus-
　　　trial Statistics.
　　Division of Vital Statistics.

　Minnesota—
　　Bureau of Labor Statistics.
　　State Board of Corrections.

　Missouri.　Bureau of Labor Sta-
　　tistics.

　Nebraska.　Bureau of Labor and
　　Industrial Statistics.

　New Hampshire.　Bureau of
　　Labor Statistics.

　New Jersey.　Bureau of Labor
　　Statistics.

　New York Public Library.
　　　　,,　　Bureau of Labor
　　Statistics.

　North Carolina.　Bureau of Labor
　　Statistics.

　Ohio.　Bureau of Labor Statistics.

　Pennsylvania.　Bureau of In-
　　dustrial Statistics.

　Wisconsin—
　　Bureau of Labor Statistics.
　　State Board of Health.
　Boston Department of Municipal
　　Statistics.
　Bankers' Magazine, The Editor.
　Bradstreet's Journal, The Editor.
　Commercial and Financial Chron-
　　icle, The Editor.
　Engineering and Mining Journal,
　　The Editor.
　Journal of Political Economy,
　　The Editor.
　Political Science Quarterly, Co-
　　lumbia College, The Editor.
　Quarterly Journal of Economics,
　　The Editor.
　Yale Review, The Editor.

During the Year 1898-99—*Contd.*

(a) **Foreign Countries—***Contd.*

United States—Contd.

Academy of Arts and Sciences.

Academy of Political and Social Science.

Actuarial Society of America.

Economic Association, Baltimore.

Geographical Society, New York.

Philosophical Society, Philadelphia.

Sound Currency Committee.

Statistical Association, Boston.

Volta Bureau.

Columbia College, New York.

United States—Contd.

Leland Stanford Junior University.

John Crerar Library.

Johns Hopkins University.

Smithsonian Institution.

Yale University.

Uruguay—

Statistical Bureau.

Director of Civil Registration.

Montevideo Statistical Bureau.

(b) **India, and Colonial Possessions.**

India, British—

Director-General of Statistics.

Finance and Commerce Depart.

Revenue and Agricultural Department.

Lieutenant-Governor of Bengal.

Bengal, The Collector of Customs.

East India Railway.

Indian Engineering, The Editor.

Asiatic Society of Bengal.

Bombay Branch of the Royal Asiatic Society.

Canada—

Department of Agriculture.

Ontario Bureau of Industries.

Insurance and Finance Chronicle, The Editor.

Royal Society of Canada.

Cape of Good Hope—

Agent-General for the Cape.

Colonial Secretary.

Registrar-General.

Ceylon—

Lieut.-Governor and Colonial Secretary.

General Manager of Government Railways.

Jamaica. Registrar-General.

Mauritius. The Colonial Secretary.

New South Wales—

Agent-General, London.

Government Statist, Sydney

Registrar-General.

New Zealand—

Registrar-General.

Registrar of Friendly Societies.

Department of Mines.

Insurance Department.

Labour Department.

Trade Review, The Editor.

Wellington Harbour Board.

Queensland—

Agent-General, London.

Registrar-General.

Rhodesia. British South Africa Company.

South Australia—

The Chief Secretary.

The Registrar-General.

Government Statist.

Public Actuary.

During the Year 1898-99—*Contd.*

(b) **India, and Colonial Possessions**—*contd.*

Straits Settlements. The Government Secretary, Perak.

Tasmania—
Government Railways Department.
Government Statistician, Hobart.
Royal Society of Tasmania.

Victoria—
Hon. the Premier of Victoria.

Victoria—*Contd.*
Assist. Government Statist.
Actuary for Friendly Societies.
Royal Society of Victoria.
Public Library, &c., Melbourne.

Western Australia—
The Government Actuary.
Acting Collector of Customs.
Registrar-General.

(c) **United Kingdom and its several Divisions.**

United Kingdom—
Admiralty Medical Department.
Board of Agriculture.
Army Medical Department.
   „   Veterinary Department.
Board of Trade.
British Museum.
Customs, Commissioners of.
Home Office.
India Office.
Labour Department.
Local Government Board.
Metropolitan Asylums Board.
Royal Mint.
Woods, Forests, &c., H.M.

England—
Registrar-General of England.
London County Council.
   „   School Board.
Metropolitan Asylums Board.
Battersea, The Vestry of.
Wandsworth Board of Works.
Birmingham City Treasurer.
Bradford City Accountant.

England—*Contd.*
Liverpool Free Public Library.
Manchester Free Public Library.
Mersey Conservancy.
The Medical Officer of Health of the Local Government Board and of the following towns : Birkenhead, Birmingham, Bolton, Bradford, Brighton, Bristol, Cardiff, Derby, Halifax, Huddersfield, Hull, Leeds, Leicester, Liverpool, Manchester, Newcastle-on-Tyne, Norwich, Nottingham, Preston, Salford, Sunderland, West Hartlepool, Wolverhampton.

Ireland. Registrar - General of Ireland.

Scotland—
Registrar-General of Scotland.
Edinburgh City Chamberlain.
Aberdeen Medical Officer.
Glasgow Medical Officer.

(d) **Authors, &c.**

Acworth, W. M., London.
Allan, Dr. F. J., London.
Altschul, Theodor, Prague.
Atkinson, Edward, U.S.A.

Back, Frederick, Tasmania.
Beeton, Mayson, M., London.
Bertillon, Dr. J., Paris.
Biddle, Dr. D., London.

During the Year 1898-99—*Contd.*

(d) **Authors, &c.**—*Contd.*

Billings, Dr. J. S., Washington.
Blenck, Herr E., Berlin.
Böckh, Dr. R., Berlin.
Bodio, Professor Luigi, Rome.
Booth, Charles, London.
Bourinot, Sir J. G., K.C.M.G., LL.D.
Bourouill, Baron.
Bourne, Arthur, Liverpool.
Boutcher, Mortimore, & Co., London.
Bowditch, Dr. H. P., London.
Bowley, A. L., London.
Brabrook, E. W., London.
Broemel, Percy R., London.
Burdett, Sir Henry, London.
Carter, Roger N., London.
Cater, J. J., London.
Clarke, Sir Ernest, London.
Coghlan, T. A., Sydney.
Constable, A. & C., Messrs., London.
Cohn, Dr. Gustav, Germany.
Coni, Dr. E. R., Argentina.
Conrad, Dr. J., Jena.
Cooper, Joseph, Farnworth.
Courtney, Rt. Hon. L. H., London.
Craigie, Major P. G., London.
Crawford, R. F., London.
Cunningham, Rev. W., Cambridge.
Deane, Albert B., London.
Dechesne, Laurent, Liége.
Dorman, M. R. P., London.
Doyle, Patrick, Calcutta.
Eaton & Sons, Messrs. H. W., London.
Einhauser, Dr. Rudolf, Konigsberg.
Ellison & Co., Messrs., Liverpool.
Elder, Dempster & Co., Messrs. London.
Engel, Dr., Cairo.
Engelbrecht, Th. H., Berlin.
Engelmann, Wilhelm, Leipsig.
Ferraris, Carlo F., Rome.
Fischer, Herr Gustav, Jena
Fléchey, Edmond, Nancy.
Folkmar, Daniel, Chicago.
Ford, Worthington C., U.S.A.

Fornasari di Verce, Dr. E., Italy.
Forster, John W., Nottingham.
Fouse, L. G., Milwaukee.
Foville, M. A. de, Paris.
Fratelli Bocca, Messrs., Torino.
Galloway, John R., Manchester.
Garland, N. S., Ottawa.
Ghewy, Albert B., London.
Ginsburg, Dr. B. W., London.
Gooch, Thomas & Sons, London.
Gow, William, London.
Gow, Wilson, & Stanton, Messrs.
Grimshaw, Dr. T. W., Dublin.
Guillaume, Dr. Louis, Bern.
Guillaumin et Cie., Messrs., Paris.
Guyot, M. Yves, Paris.
Haggard, F. T., Tunbridge Wells.
Hall, Thomas, New South Wales.
Hart, Sir R., Bart., G.C.M.G., Peking.
Helmuth Schwartze & Co., Messrs.
Hoar, Hon. George F., U.S.A.
Humphreys, N. A., London.
Hyde, John, U.S.A.
Inama-Sternegg, Dr. K. T., Vienna.
Janssens, Dr. E., Brussels.
John, Prof. V., Jena.
Johnson, Geo., Ottawa.
Johnson, George, London.
Johnston, R. M., Hobart.
Juraschek, Dr. F. v., Vienna.
Kegan Paul & Co., Messrs., London.
Kelly, Charles, M.D., F.R.C.P.
Keltie, J. Scott, London.
Kemper, Dr. G. de Bosch.
Kennedy, Sir Charles, Exmouth.
Kiær, M. A. N., Christiania.
King, A. W. W., London.
King, Messrs. P. S. & Sons, Westminster.
Körösi, M. Joseph, Budapest.
Kropotkin, P., London.
Latzina, Dr. F., Buenos Ayres.
Leroy-Beaulieu, M. Paul, Paris.
Linroth, Dr. K., Stockholm.

During the Year 1898-99—*Contd.*

(d) **Authors, &c.**—*Contd.*

McHardy, C. McL., London.
Macmillan & Co., Messrs., London.
March, Lucien, Nancy.
Marshall, Alfred, Cambridge.
Mayr, Dr. G. von, Strassburg.
Methuen & Co., Messrs., London.
Maude, Capt. F. N., London.
Mitchell & Co., Messrs., London.
Molinari, M. G., Paris.
Money, Alonzo, C.B., Cairo.
Morgan, Percy C., London.
Moss & Co., Messrs. R. J., Egypt.
Moxon, Thomas B., Manchester.
Muirhead, J. M. P., Grahamstown.
Murray, Adam, London.
Neumann, J. O., London.
Newsholme, Dr. A., Brighton.
Neymarck, A., Paris.
Norman, J. H., London.
O'Conor, J. E., C.I.E., India.
Outerbridge, A. E., Philadelphia.
Page & Gwyther, Messrs., London.
Palmer, Sir E. M., K.C.M.G., Cairo.
Parker, E. H., London.
Payne, A. W., London.
Petersen, Aleksis, Copenhagen.
Pierson, Israel C., New York.
Pierson, N. G., Haarlem.
Pim, Joseph T., Dublin.
Pistorius, Dr. Verkerk, The Hague.
Pittar, T. J., London.
Pixley & Abell, Messrs., London.
Pixley, Francis W., London.
Powell, Messrs. T. J. & Co., London.
Probyn, L. C., London.
Raffalovich, Arthur, Paris.

Rawson, Sir R. W., K.C.M.G., C.B.
Reid, H. Lloyd, London.
Reis, J. Batalha, London.
Rew, R. H., London.
Ronald & Rodger, Messrs., Liverpool.
Rothwell, R. P., New York.
Rowntree, Joseph, London.
Rozenraad, C., London.
Schloss, David F., London.
Schmoller, Dr. G., Germany.
Seligman, Prof. E. R. A., New York.
Seyd, Richard, London.
Shafroth, Hon. J. F.
Sharp, Granville, Hong Kong.
Sherwell, Arthur, London.
Shillito, J., York.
Sidenbladh, Dr. K., Stockholm.
Sodoffsky, Dr. Gustav, Stuttgart.
Stanton, A. G., London.
Stein, Sigmund, Liverpool.
Stephens, W. Walker, Edinburgh.
Thompson, W. J. & Co., London.
Troïnitsky, M. N., St. Petersburg.
Tupper, A. B., Argentina.
Urmson, Elliot, & Co., Liverpool.
Ussher, R., London.
Webersik, Gottlieb, Vienna.
West, Max, New York.
Whitelegge, B. Arthur, London.
Whiteley, William, London.
Wilbur, Cressy L., New York.
Williams and Norgate, London.
Wilson, Effingham, London.
Wood, G. H., Bristol.
Wright, Hon. C. D., Washington.
Young, T. E., London.

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(e) **Societies, &c. (British).**

Accountants & Auditors, Society of.
Actuaries, Institute of.
Anthropological Institute.
Arts, Society of.

Bankers, Institute of.
Bimetallic League.
British Economic Association.
　　,,　　Iron Trade Association.

During the Year 1898-99—*Contd.*

(e) **Societies, &c. (British)**—*Contd.*

British Association.
   ,,   Fire Prevention Committee.
Chartered Accountants, Institute of.
Civil Engineers, Institution of.
Cobden Club.
East India Association.
Glasgow Philosophical Society.
Gold Standard Defence Association.
Howard Association.
Imperial Institute.
Incorporated Accountants' Society.
International Statistical Institute.
Iron and Steel Institute.
Liverpool Lit. and Phil. Society.
London Chamber of Commerce.
   ,,   Hospital.
Manchester Lit. and Phil. Society.
   ,,   Statistical Society.
Medical Officers of Health, Society of.
Middlesex Hospital.

Mitchell Library, Glasgow.
Peabody Donation Fund.
Royal Agricultural Society.
   ,,   Asiatic Society.
   ,,   College of Physicians.
   ,,   College of Surgeons.
   ,,   Geographical Society.
   ,,   Institution of Great Britain.
   ,,   Irish Academy.
   ,,   Meteorological Society.
   ,,   Society, Edinburgh.
   ,,   Society, London.
   ,,   United Service Institution.
St. Bartholomew's Hospital.
Sanitary Institute of Great Britain.
Society for Propagation of the Gospel in Foreign Parts.
Statistical and Social Inquiry Society of Ireland.
Surveyors' Institution.
University College, London.

(f) **Periodicals, &c. (British).** *The Editors of*—

Accountant, The, London.
Athenæum, The, London.
Australian Trading World, The, London.
Bankers' Magazine, The, London.
British Trade Journal, The, London.
Building Societies, &c., Gazette, The.
Citizen, The, London.
Colliery Guardian, The, London.
Commercial World, The, London.
Cotton, Manchester.
Economic Review, The, London.
Economist, The, London.
Finance Chronicle, The, London.
Finance Examiner, The London.
Fireman, The London.

Incorporated Accountants Journal.
Insurance Post, The, London.
Insurance Record, The, London.
Investors' Monthly Manual, The.
Investors' Review, The, London.
Iron and Coal Trades' Review, The.
Johannesburg Standard, &c., The London Edition.
Licensing World, The, London.
Machinery Market, The, London.
Nature, London.
Policy-Holder, The, Manchester.
Post Magazine, The, London.
   ,,   Almanack, London.
Sanitary Record, The, London
Shipping World, The, London.
Statist, The, London.

ROYAL STATISTICAL SOCIETY,

(9, Adelphi Terrace, Strand, W.C., London).

Those persons who are inclined to benefit the Society by legacies are recommended to adopt the following

FORM OF BEQUEST.

I give and bequeath unto the "Royal Statistical Society," the sum of £   , such legacy to be paid out of such part of my personal estate, not specifically bequeathed, as the law permits to be appropriated by will to such a purpose.

Note A.—All gifts by will to the Society of land, or of money secured on, or directed to be secured on, or to arise from the sale of, or directed to be laid out in the purchase of land, will be void. Gifts may be made by will of stock in the public funds, shares or debentures of railway or other joint-stock companies, or money to be paid out of the testator's pure personal estate, or of personal chattels.

Note B.—Bequests may be made either for the general purposes of the Society, or to the Society's "Building Fund."